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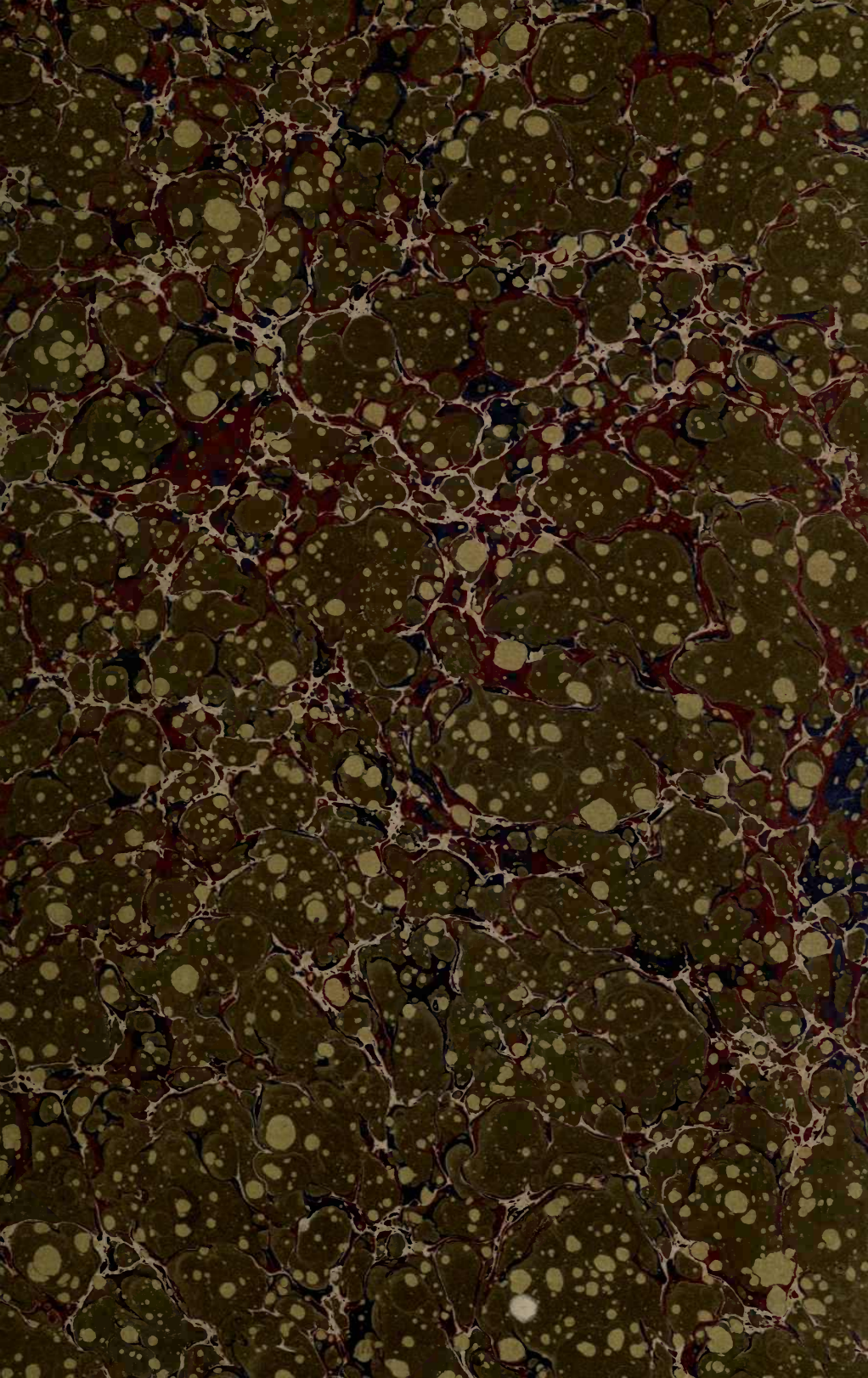
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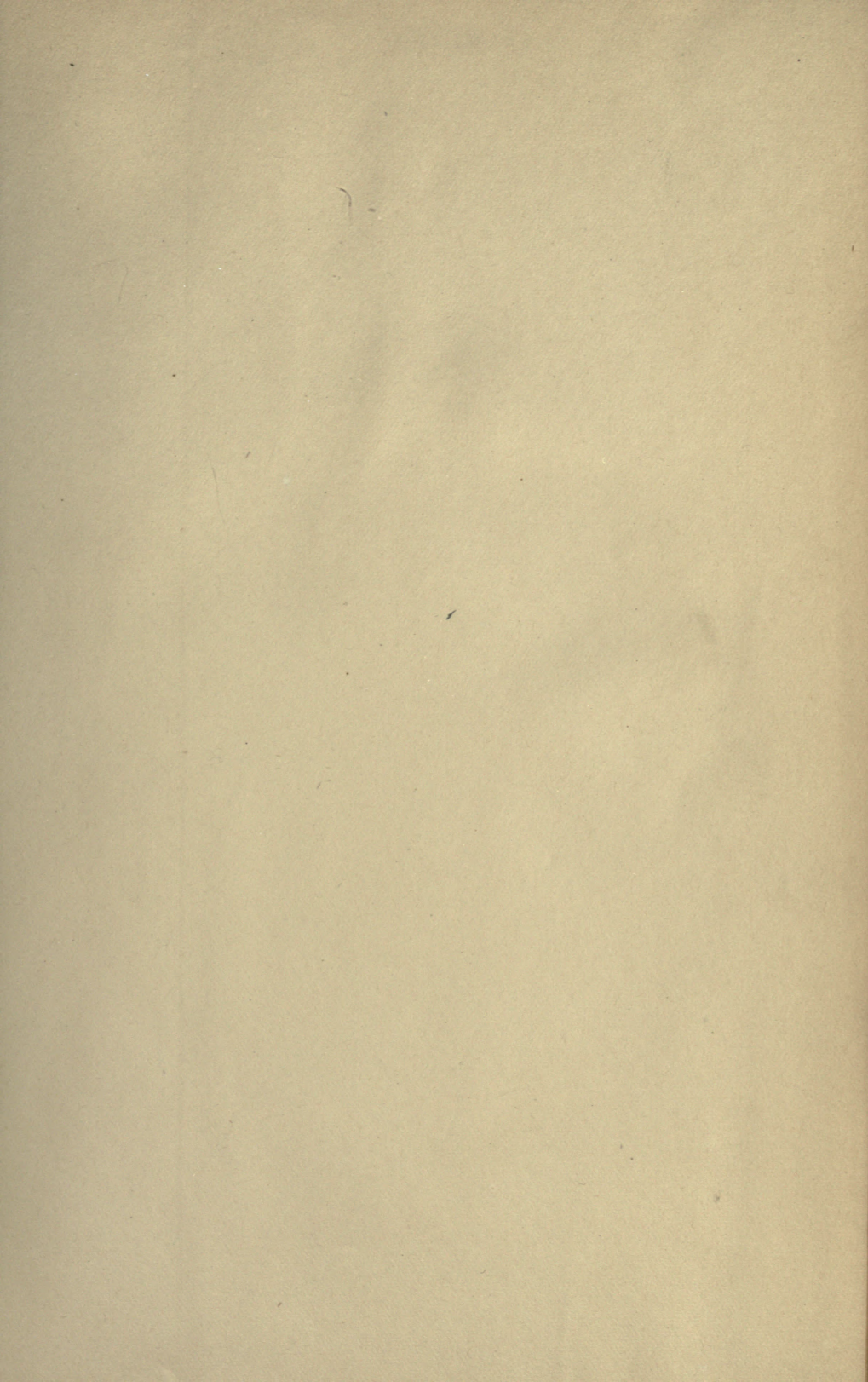












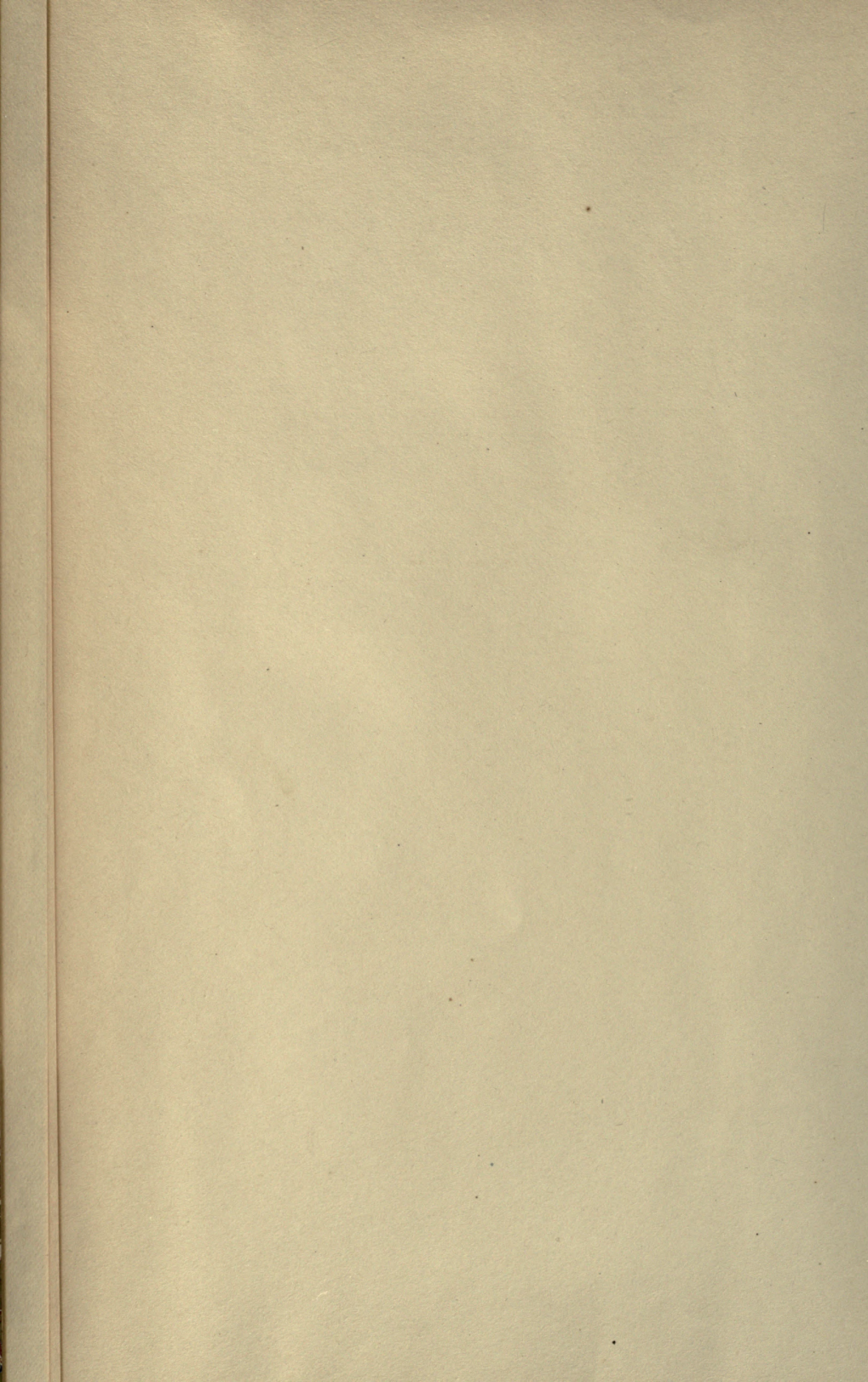




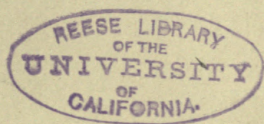


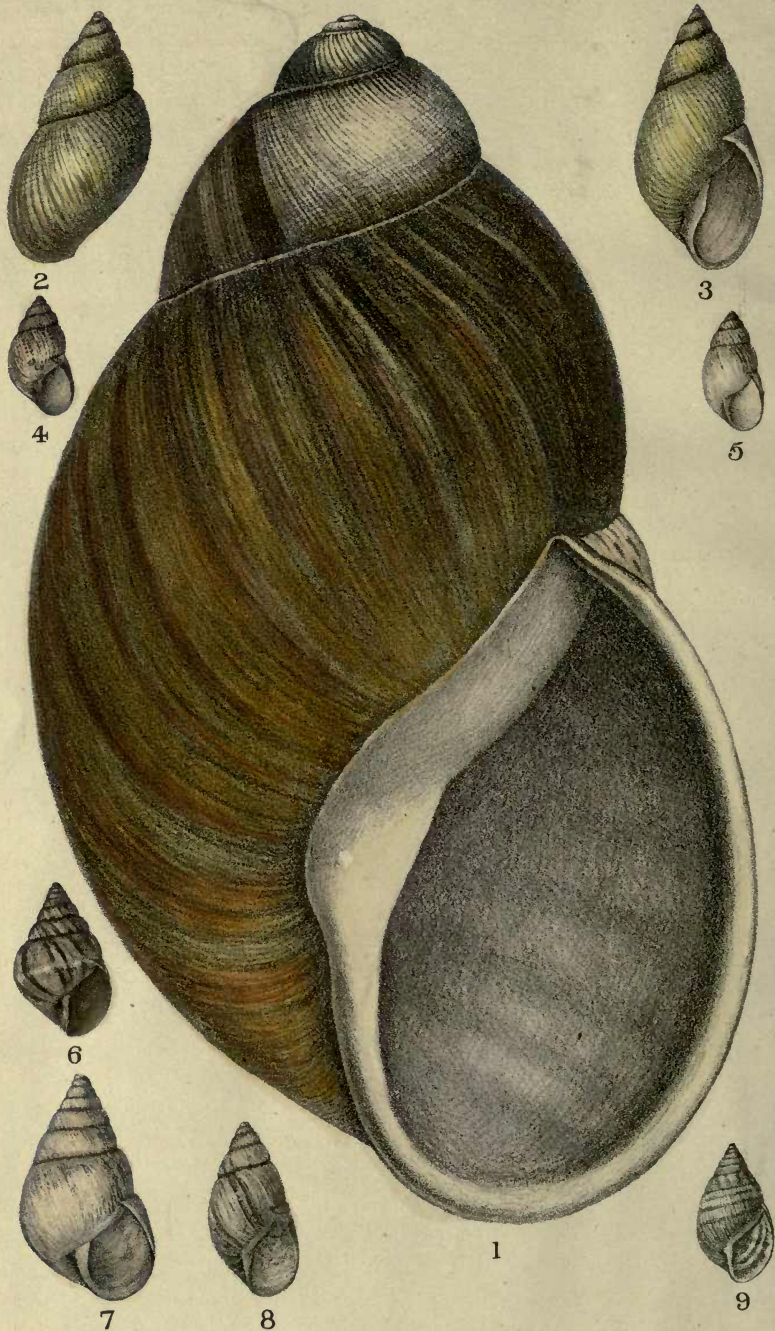














SECOND SERIES: PULMONATA.

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MANUAL  
OF  
CONCHOLOGY;

STRUCTURAL AND SYSTEMATIC.

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WITH ILLUSTRATIONS OF THE SPECIES.

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By GEORGE W. TRYON, JR.

CONTINUATION BY

HENRY A. PILSBRY,

CONSERVATOR OF THE CONCHOLOGICAL SECTION OF THE ACADEMY OF  
NATURAL SCIENCES OF PHILADELPHIA.

---

Vol. X.

AMERICAN BULIMI AND BULIMULI.

STROPHOCHEILUS, PLEKOCHAILUS, AURIS, BULIMULUS.

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"THE number of species described by authors who cannot determine their affinities increases annually, and I regard the naturalist who puts a described plant into its proper position in regard to its allies as rendering a greater service to science than its describer when he either puts it into a wrong place or throws it into any of those chaotic heaps, miscalled genera, with which systematic works still abound."—*Sir Joseph Hooker*, *Flora Brit. Ind.*, i, vii.





In the volumes treating of Bulimiform snails I shall follow the plan of the several later volumes on Helices, endeavoring to make the identification of species as easy as is possible in the present condition of conchological science. Although the descriptions are constructed upon a model differing slightly from that of Pfeiffer, and in a tongue less terse, still I have aimed at the concise style and directness of the great German; and when the material before me rendered it possible, tables or "keys" have been introduced, to further lessen the tedious labor of specific identification.

A classification of the entire group with anatomical details will be presented upon the completion of the volumes descriptive of the shells, as it seems convenient to make such division rather than to lengthen the text by the inclusion of a consideration of the soft anatomy. As in the Helices, the general classification of Bulimi seems to require fundamental reformation; and in many cases characters never before used in their taxonomy are herein considered diagnostic of groups. The resulting re-arrangement of species greatly modifies zoögeographic inferences based upon the older groupings, and it is believed throws new light upon the problems of animal distribution.

*H. A. P.*



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[NOTE.—The remaining subgenera of *Bulimulus* will be included in Volume XI of the MANUAL.]



Genus STROPHOCHEILUS Spix, 1827.

(=*Strophocheilus*+*Borus*+*Dryptus*+*Orphnus* of authors).

*Strophocheilus* SPIX in Wagner, Test. Fluv. Bras., etc. p. 12, and on plate XI (for *S. hæmastomus* Spix=*Helix ovata* Müller, and *S. almeida* Spix=*Helix pudica* Müller).—*Melania* (in part) PERRY, Conchology, 1811, pl. 29. Not *Melania* Lamarck, 1799.—*Bulinus* SCOPOLI, Deliciæ Floræ et Faunæ Insubricæ, i, p. 67 (1786). Not *Bulinus* Scopoli, Introductio ad Hist. Nat. p. 392 (1777).—*Bulinus* LAMARCK, 1801, Montfort, 1810, and (in part) of all subsequent writers on South American land snails.—*Bulinus* SOWERBY (in part), P. Z. S., 1834, p. 141, and Conchological Illustrations. Not *Bulinus* Müller, Der Naturforscher xv, p. 6 (1781).—*Helix*, subgenus *Cochlostyla*, second group, *Aplotomæ* (err. typog.) in part; FER., Tabl. p. 48; also, subgenus *Cochlogena*, third group, *Lomas-tomæ* (in part), FER., Tabl., p. 54.

For general anatomy, dentition and (incorrect!) figures of genitalia, see SEMPER, Reisen p. 150, pl. 14, f. 10; and VON IHERING, Bull. Sci. de la France et de la Belgique, xxiii p. 213, pl. 5, f. 11.

Shell ovate, more or less lengthened, always much higher than wide; of moderate or large size, with 4 to 7½ whorls. Apex obtuse. Several earlier whorls forming the large nepionic shell (or part formed within the egg), which is usually sculptured differently from the post-natal portion. Post-nepionic shell consisting of 2½ whorls or less. Aperture vertical or nearly so, much higher than wide; peristome reflexed, expanded, or simple and obtuse; columella with a convex fold or simple. Type *S. pudicus* Müller.

Soft parts externally as in *Helicidæ* (Manual IX, p. xxviii), but labial processes more strongly developed, lobed. Genitalia of the Protozonous type, but with an appendicula as in *Panda* and *Caryodes*. Jaw completely solid, smooth or ribbed. Radula in general as in *Helicidæ*, the rhachidian and lateral teeth unicuspid by fusion of the cusps, marginals, or some of them, with an ectocone added. Reproducing by large oval or oblong hard-shelled white eggs. Habits terrestrial.

Distribution, tropical and temperate South America and some adjacent islands. Mainly east of the Andean watershed.

The genus *Strophocheilus* represents, in our opinion, a line divergent from the early PROTOGONA, probably allied to the Australian forms of Old World large-egged *Helices* which we have called



*Macroogona* (Man. Conch. IX, pp. xxxii, 148). These *Bulimi* are, therefore, just as genuine *Helices* as the genera *Polygyra*, *Acavus* or *Panda*. The tendency to separate "Bulimoid" from "Helicoid" genera seems in the light of present knowledge a wrong one; and it is daily becoming clearer that the character of shell-contour is of quite secondary value.

From the above definition and synonymy, the critical student of malacology and its literature will at once and rightly conclude that the present group is not only different in name from the genus "*Bulimus*" as defined in *Die Heliceen*, *Die Binnenmollusken Venezuelas*, etc., but that it differs widely in limits also. *Plekocheilus*, *Eurytus* and *Pachyotus* formerly classed here, have been removed. The former two have small eggs and consequently far smaller nepionic shells, flagellum-bearing penis, finely plaited jaw, etc.,—all features which effectually sunder them from the *Strophocheilus* and *Borus* group. The distinction is not only visible to the anatomist, but the comparative size of the embryo at time of extrusion from the egg offers a good conchological feature observable in any specimen having the spire perfect and unworn. *Pachyotus* is a group reproducing by minute eggs and having various differential characters to be more fully discussed later.

*History of the names Bulinus, Bulimus and Strophocheilus.*

PRE-LINNÆAN.

1757. ADANSON, in his *Histoire Naturelle du Sénégal*, *Coquillages*, p. 5, pl. 1, Genus II, describes and figures under the name "Le Bulin. *Bulinus*" a small fresh-water snail like a *Physa* but with even-edged mantle, and belonging to the genus of *Planorbinae* now known under the names *Bulinus*, *Ameria*, *Physopsis*, etc. The etymology of *Bulinus* is unknown, for most of Adanson's names are new arbitrary combinations; but it is likely that the French word *Bulle* was its basis. As Adanson's names are not Linnæan in form, and were published before the period universally adopted as the starting-point of binomial zoological nomenclature, it is obvious that they can properly have no bearing, whatever, upon modern nomenclature. When revived by post-Linnæan authors, they must date from the time of such revival, without reference to Adanson's prior use. Any other course would admit Adansonian names for a large proportion of the Linnæan and Lamarckian genera.

## POST-LINNÆAN.

1777. SCOPOLI, in the *Introductio ad Historiam Naturalium*, restricts the genus *Helix* of Linnæus, and proposes BULIMUS ADANS. *Testa univalvis, non umbilicata; apertura ovali. Molluscum tentaculis binis, basi appendiculatis; puncto ophtalmoide distincto aut radicali* SWAMMERDAM. *Tab. IX, Fig. 4.*

“*Helix putris, fragilis, stagnalis, tentaculata* LINN. nec non aliæ non paucae terrestres Cl. MULLERII.”

The figure of Swammerdam referred to as representing the characters of animal, represents a Dutch *Limnæa*, species uncertain, probably *stagnalis* or *palustris*. The Linnæan species cited are: *Helix putris* (= *Succinea amphibia* Auct.), *H. fragilis* and *stagnalis* (= *Limnæa*), and *H. tentaculata* (= *Bythinia*). *It will be noted that no land shells are named. This is the first appearance of the name Bulimus in scientific literature.*

As Scopoli quotes the name as of Adanson, it has been surmised that “Bulimus” was a typographical error for “Bulinus.” Whether this was the case or not would have absolutely no effect upon our use of the name, for (1) Scopoli’s group does not rest upon Adanson for its elucidation, nor does he refer to Adanson’s page or plate; (2) that it was a typographical error cannot be proven; it may have been an emendation on etymological grounds, and Scopoli’s subsequent use of the same orthography would show it to have been a deliberate change; and finally (3) Adanson being pre-Linnæan cannot prejudice properly proposed post-Linnæan names.

It would appear that *Bulimus* Scopoli, by the process of elimination, must replace the generic name *Bythinia*. *Conf. Dall, Trans. Wagner, Free Inst. Sci. iii, p. 334, and Smith, P. Z. S., 1893, p. 636.*

1781. O. F. MULLER, in *Der Naturforscher*, pp. 1–20, *Geschichte der Perlen-Blasen*, gave an exhaustive account of *Physa fontinalis* (*Planorbis bulla* Müll.) with figures, noticing particularly the digitated mantle-edge, etc. and proposing to restrict *Planorbis* to the flat shells, and adopt the Adansonian name *Bulinus* for the lengthened forms, of which he enumerates:

1, BULINUS *perla*, the present “Perlen-Blasen.”

*Planorbis bulla. Verm. test., 353.*

2, BULINUS *turritus*.

*Planorbis turritus. Verm. test., 354.*



3, *BULINUS gelatinus*.

*Planorbis gelatinus*. *Verm. test.*, 355.

4, *BULINUS senegalensis*.

ADANS. *Hist. Nat. de Sénég.* p. 5, t. 1.

Although Müller includes Adanson's species in his group, it must distinctly be remembered that his description applies to *Physa*; and it is only by disregarding his real idea of the structure of the snails that we can restrict the group to the last species.

However this question may be settled, the fact remains that the name *Bulinus* was first introduced in binomial nomenclature by Müller in 1781; and his clearly expressed intention was to apply it to what is known as *Physa*.

1786. SCOPOLI introduces the genus *Bulinus* again, to contain *B. hæmastomus*, giving a figure which has been referred to *Borus oblongus* but which looks as much like the rarer species *B. granulatus*.

This later use of the name by Scopoli is not accompanied by a generic diagnosis, and being nine years later than his first publication, cannot stand. Bruguiere, Lamarck and other early authors have followed Scopoli's later work, ignoring the earlier; and the name *Bulinus* has thus come into universal use until this time.

SUMMARY.—From the foregoing sketch, we conclude:

(1). That *BULINUS* Adanson must be absolutely ignored in nomenclature.

(2). That *BULINUS* Scopoli, 1777, will stand as a valid genus, and the name must replace either *Succinea*, *Limnæa* or *Bythinia*, preferably the last.

(3). *BULINUS* Müller, 1781, stands as a generic name for either *Bulinus* of authors (Fischer, Man. p. 509) or for *Physa* Drap., 1801.

(4). That the use of the term *Bulinus* by Scopoli in 1786, and by subsequent authors, and the use of *Bulinus* by Broderip, Sowerby and others during the present century, has no bearing upon the questions at issue.

1827. The name *STROPHOCHEILUS* was applied in *MS.* by Spix, to two species collected by him in Brazil, *hæmastomus* Spix and *almeida* Spix. Wagner, in his work on the Spix collection and MSS., places these names in the synonymy under *Bulinus ovatus* and *Bulinus pudicus*. On the plate there is a double inscription, the names given by both Spix and Wagner appearing. It is perfectly

clear that Spix intended his group to contain *Bulimi* with reflexed or turned-over lip (whence the name). The group has been adopted by Albers-Martens, Pfeiffer and others with *almeida* (*pudicus*) as its type, and may be considered firmly established. All other generic or subgeneric names founded upon members of the genus (as here constituted) are considerably later, 1850 to 1860. For their history, see references under the several subgeneric captions.

*Subdivisions of Strophocheilus.*

*Strophocheilus*, in the enlarged generic sense in which it is herein used, consists of four groups of species, moderately distinct in appearance, but difficult to define clearly.

Subgenus I, STROPHOCHEILUS Spix.

Shell ovate-oblong, brown or white and rose under a yellow cuticle; surface smoothish with microscopic spirals or closely malleated and wrinkled; outer lip well reflexed and recurved; columella reflexed, the fold inconspicuous.

Subgenus II, BORUS Albers.

Shell ovate, capacious, solid, the spire short; outer lip either thickened or reflexed, whitish or roseate; columellar fold low or inconspicuous.

Subgenus III, DRYPTUS Albers.

Shell ovate or elongated, solid, dark brown or zebra-striped, the surface rather smooth; lip varying from slightly expanded to reflexed, white or brown. Columellar fold conspicuous or weak.

Subgenus IV, THAUMASTUS Albers.

Shell long-ovate, with lengthened spire, striate or wrinkled, sometimes decussated; streaked or banded. Aperture small, less than half the shell's length; outer lip blunt, not expanded or reflexed; columellar fold weak or imperceptible. This group includes *Oph-nus* Alb., preoccupied.

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Subgenus STROPHOCHEILUS Spix, 1827.

*Strophocheilus* SPIX, in WAGNER, Testacea fluviatilia quæ in Itinere per Brasiliam, etc., collegit et pingenda curavit Dr. J. B. de



Spix, digessit, descripsit, etc., Dr. J. A. Wagner, p. 12, pl. 11, (1827); species *S. hæmastomus* Spix (= *B. ovatus* Müller), and *S. almeida* Spix (= *B. pudicus* Müller).—*Strophochilus* ALBERS-MARTENS, Die Hel. 1860, p. 191, type *B. almeida* Spix.—*Coniclus* ALBERS, Die Hel. 1850, p. 147.

Shell ovate-oblong, subperforate and solid, brown, or white and rose under a yellow cuticle. Surface smoothish to the eye or finely malleated, the lens showing close minute spiral striæ throughout (except in *S. pudicus*). Nepionic shell large.

Aperture long-ovate, the lip brown or rose colored, well reflexed and recurved, often with a tooth within, columella reflexed, the fold inconspicuous, not thickened. Type *S. pudicus* Müll.

This group contains a number of Brazilian species of moderate size, allied to *Borus* in the large nepionic shell. *Strophocheilus* differs from *Plekocheilus*, *Eurytus* etc. in having the nepionic shell proportionally large, post-nepionic whorls two or slightly less; while those groups have a much smaller nepionic shell, often very indistinctly demarked, and more post-nepionic whorls.

The subgenus consists of two groups of species:

- I. *Strophocheilus* (s. str.). Shell malleated; no spiral striæ,  
*S. pudicus*.
- II. *Coniclus* Alb. (restricted). Shell sculptured with minute spiral striæ.
  - a. Surface of body-whorl finely malleated throughout.
    - b. Obese; peristome and parietal wall dark brown; outer lip toothed, *unidentatus*.
    - bb. Oblong; peristome rose and white; lip not toothed,  
*erythrosoma*.
  - aa. Surface smooth or hardly malleated, lip roseate.
    - b. Brown, with satiny bands; spiral striæ beaded; earlier whorls spirally striated; lip not toothed, *milleri*.
    - bb. Yellow and rose; earlier whorls vertically striated; outer lip toothed, *planidens*.
    - bbb. Chestnut colored, with zigzag streaks and spots of golden; outer lip not toothed, *rhodocheilus*.

*S. PUDICUS* Müller. Pl. 19, figs. 37, 38.

Shell oval-oblong umbilicated, rather solid, roseate under a thin pellucid yellowish cuticle, the rose often fading to white on the back of last whorl. Surface coarsely and irregularly netted with close lon-

*gitudinal and more spaced transverse wrinkles*, spire (nepionic whorls) closely and regularly rib-striate, first whorl planorboid, smooth. Whorls 5, convex, the last obliquely descending.

Aperture decidedly over half the shell's length, lilac within; *peristome very broadly expanded reflexed and recurved*, white or lilac-tinted; its face rounded. Columella widened above, the inner edge faintly convex; parietal callus whitish, more or less translucent.

Alt. 60, diam. 31; aperture, alt. 36 mill.

Alt. 53, diam. 30; aperture, alt. 33 mill.

Alt. 48½, diam. 23; aperture, alt. 26 mill.

*Province of Bahia, Brazil.*

*Helix pudica* MULL., Verm. Terrest. et Fluv., ii, p. 97.—GMELIN, Syst. Nat. (13), p. 3645.—*Bulimus pudicus* BECK, Index, p. 53.—PFR., Conchyl. Cab. pl. 22, f. 3; Monogr. ii, p. 53; Malak. Bl. 1857, p. 179.—REEVE, Conch. Icon. pl. 31, f. 191.—DESH. in Fér. Hist. p. 30, pl. 143, f. 11–13.—*Partula pudica* Fér., Prodr. p. 66.—POT. & MICH., Galerie, i, p. 198, pl. 20, f. 7, 8.—? *Helix erubescens* SOLANDER, Portland Catal.—*Auris virginea*, etc., CHEMN. Conchyl. Cab. ix, pt. 2, p. 44, pl. 121, f. 1042 (same specimen described by Müller).—*Bulimus virgineus* BRUG., Encycl. Méth. p. 315.—*Voluta auris virginis* DILLWYN, Descr. Catal. i, p. 502.—*Partula australis* BOWDICH, Elem. Conch. pl. 8, f. 30.—*Strophocheilus almeida* SPIX, Test. Bras. pl. 11, f. 2, 3.—*Bulimus almeida* PFR., Monogr. iv, p. 377.—*Bulinus myersii* SOWB., Conch. Illustr. f. 98.—*Bulinus perplexus* SOWB., Conch. Illustr., index, no. 98.

This species approaches *Plekocheilus* in sculpture, differing from *S. planidens* and *milleri* in lacking spiral striation. The large nepionic shell, however, shows that the species is most nearly allied to the forms here following. The lip varies from white to rose in color.

*S. PLANIDENS* Michelin. Pl. 22, fig. 50.

Shell perforate or closed, ovate-oblong, rather solid, shining, greenish- or brownish-yellow, slightly transparent, the spire pink. Surface smooth except for growth-lines and *densely crowded microscopic incised striae*, somewhat waved; the whorls of spire obliquely, densely striate. Whorls 5, the first planorboid, forming an obtuse apex; the last whorl obliquely descending, suture falling more rapidly toward the aperture.



Aperture over half the shell's length, nearly vertical, bluish-white inside; *peristome* rose-red, abruptly, flatly reflexed (the whorl contracted behind it), *outer lip* bearing a small, flat-topped tooth in the middle. Columella reflexed, rather narrow; parietal callus roseate.

Alt. 66, diam. 33; alt. of aperture 37 mill.

Alt. 60, diam. 29; alt. of aperture 32 mill.

*Brazil; near New Freiburg.*

*B. planidens* MICH. in Guérin's Mag. de Zool. 1831, pl. 31.—DESH. in Lam., An. s. Vert. p. 239; in Fér., Hist. p. 38, pl. 143, f. 4, 5.—KUSTER, Conchyl. Cab. p. 17, pl. 3, f. 1.—REEVE, Conch. Icon. pl. 31, f. 190.—PFR., Monogr. ii, p. 54; vi, p. 23.—*Helix planidens* RANG.

Specimens occur with the tooth of the outer lip much reduced or even absent; but these are still readily distinguished from *S. milleri* by the flat lip, contraction of whorl behind it, less oblique columella and lack of satin zones. There is occasionally a very slight reticulate malleation on the back.

*S. RHODOCHEILUS* Reeve. Pl. 22, fig. 53.

Shell scarcely perforate, ovate-oblong, solid, minutely decussate-granulate, shining; *chestnut colored, elegantly decorated with lightening-streaks and triangular spots of golden*. Spire convex-conic, the apex obtuse. Whorls 5, first subplanulate, penultimate more convex, the last whorl obliquely descending, longer than the spire, hardly attenuated toward the base. Columella somewhat folded, receding, whitish. Aperture a little oblique, oblong-semioval; *peristome deep rose color*, expanded and reflexed throughout. Alt. 55, diam. 25 mill.; alt. of aperture with peristome 31, width 21 mill. (*Pfr.*).

*Brazil.*

*B. rhodocheilus* REEVE, Conch. Icon. pl. 28, f. 173.—PFR., Monogr. iii, p. 315.

I have not seen this form, which seems most nearly allied to *S. planidens*.

*S. MILLERI* Sowerby. Pl. 22, figs. 54, 55.

Shell nearly imperforate, ovate-oblong, rather solid, shining; chestnut or olive-brown, darker on spire; surface with the sheen of watered silk or satin, *having spiral zones of changeable luster*. Sur-

face under a lens showing very minute and close, *finely beaded spiral striæ* throughout. Whorls 5, the first planorboid with sunken tip, forming an obtuse apex; last whorl obliquely descending.

Aperture about half the shell's length, somewhat oblique, purplish within; peristome reflexed, recurved, *deep rose colored*, broad and spreading below; *columella expanded above, its inner edge straight and oblique*; parietal callus bluish. Alt. 57, diam. 31; alt. of aperture 29 mill.

Brazil.

*Bulinus milleri* SOWB., Conch. Illustr. f. 94.—*Bulinus milleri* REEVE, Conch. Syst. ii, pl. 174. f. 94; Conch. Icon., pl. 28, f. 169.—PFR., Symbolæ, ii, p. 48; Monogr. ii, p. 25; vi, p. 12.

The granulose striæ and satin zones of the surface distinguish this from *S. planidens*, aside from the tooth and differently formed columella of the latter.

*S. UNIDENTATUS* Sowerby. Pl. 22, fig. 56.

Shell imperforate or nearly so, ovate, swollen, solid and strong; *part roseate, part white*, under a yellowish-brown cuticle. Surface having inconspicuous growth-lines, a *shallow malleation, and dense microscopic spiral striation*. Whorls nearly 5, the first planorboid, the last obliquely descending, large and oval.

Aperture somewhat oblique, small, somewhat over half the total length, white inside; *peristome reflexed and recurved, dark brown throughout, the outer lip bearing a whitish tooth-like nodule in the middle*. Columella narrow, hardly wider above, foldless; and together with the rather heavy parietal callus, dark brown throughout. Alt. 53, diam. 32 mill.; aperture measured outside peristome, alt. 29, width 20½ mill.

*La Plata valley* (coll. A. N. S. P.); Brazil (Pfr.).

*Partula unidentata* SOWB. in Catal. Tank. coll., appendix, p. vii.—GRAY, Ann. of Philos. (n. s.) ix, p. 415.—*Bulinus unidentatus* BECK, Index, p. 53.—PFR., Symb. iii, 88; Monogr. ii, p. 54.—DESH. in Fér., Hist. p. 99, pl. 143, f. 6.—PHIL., Abbild. iii, p. 99, pl. 9, f. 8.—REEVE, Conch. Icon. pl. 31, f. 192.

A rare species. The sculpture is like *S. erythrosoma*, differing from *planidens* in being malleated. The tooth of outer lip, brown peristome and obese form readily distinguish the species.



*S. ERYTHROSOMA* n. sp. Pl. 22, figs. 51, 52.

Shell nearly imperforate, ovate, solid and strong; *part roseate, part white under a yellow cuticle*. Surface having inconspicuous growth-lines, a fine, *shallow malleation, and dense, microscopic spiral striation*. Whorls  $4\frac{3}{4}$ , the first planorboïd, the last obliquely descending.

Aperture oblique, small and narrow, somewhat over half the shell's length, white inside; *peristome reflexed, recurved*, thick, rounded on the face, *rose-color, but white at the outer-basal portion*; there is a perceptible thickening at the middle of the outer lip, but no tooth. Columella roseate, narrow below, reflexed and recurved, hardly widened above, and foldless. Parietal callus heavy, rose-colored toward the margin, white within, the white extending upon the inner, upper part of columella. Alt. 53, diam. 28 mill.; aperture measured outside peristome, alt. 28, width 18 mill.

*Brazil* (J. G. Anthony).

Differs from *S. pudicus* in the micro-sculpture, thick lip and narrow aperture; from *planidens* and *milleri* in the malleation, etc. It is more nearly allied to *unidentatus*, which has the same sculpture, but the spire is slenderer and more produced, mouth narrower, lip not dentate and differently colored.

#### Subgenus BORUS Albers, 1850.

*Borus* ALBERS, Die Hel. 1850, p. 141.—ALBERS-MARTENS, Die Hel. 1860, p. 191, type *B. oblongus*.—*Bulimus* SCOPOLI Deliciæ Floræ et Faunæ Insubricæ, i, p. 67 (1786), not *Bulimus* SCOPOLI, Introductio ad Historiam Naturalem, p. 392 (1777).—*Bulimus* LAMARCK, Système des Anim. s. Vert. p. 90 (1801), and of MONTFORT, and subsequent authors.—*Bulinus* SOWERBY (in part), not *Bulinus* (Adans.) MULLER, Der Naturforscher xv, p. 6 (1781), = *Physa* Drap., 1801.—*Strophocheilus* SPIX, in part.

Shell ovate, capacious, imperforate or nearly so, solid, the apex obtuse, nepionic whorls generally longitudinally costulate, the following whorls of spire with spiral rows of minute granules, last whorl smoothish, malleated or granulated. Aperture subvertical, ovate or trapezoidal; peristome blunt, thickened or reflexed; columella with a weak fold above, or none. Type *S. oblongus* Müll.

This group comprises all of the largest species, and ranges from Argentina and Ecuador to Trinidad and some adjacent islands.

*Key to species of Borus.*

[NOTE.—In this key, which is an amplified and modified form of one given by von Martens, some difficulty will be found in distinguishing between sections I and II. In cases of doubt a species may well be tried in both sections.]

## I. Earlier whorls with close, sharp, long riblets.

A. *Peristome white, yellowish or pale brownish.*

## a. Aperture trapezoidal, rather short; shell stout, large.

## b. No very distinct angle between columella and parietal wall.

c. Large, 130–150 mill. alt.; a nodule on parietal wall above,  
*popelairianus.*cc. Smaller, 95–105 mill.; no nodule, *huascari.*bb. A distinct angle between columella and parietal wall,  
*maximus.*

## aa. Aperture narrower, rather pear-shaped; shell slenderer, of moderate size.

## b. Body-whorl not noticeably granulated.

c. Riblets of last nepionic whorl unequal; spire slender, lip narrow, *santacruzii.*cc. Riblets subequal; spire short, stout; lip narrow, thick, *mathiusii.*ccc. Shell heavier, lip broad, spire slender, *lacunosus.*bb. Body-whorl granulated throughout, *durfeldti, hupeanus.*AA. *Peristome rose-red; shell granulated throughout.*a. Shell solid, elongated, with rather slender spire, lip narrow, *granulosus.*

## II. Earlier whorls with wider, fold-like ribs.

A. *Surface densely, microscopically striolate vertically throughout.*a. Body-whorl variegated with zigzag light or denuded markings, *valenciennesi.*aa. Body-whorl without such markings; spire purple-brown with light suture, *cantagallanus.*AA. *Surface without minute vertical, regular striolæ; usually malleated.*

## a. Peristome rose colored.

b. Lip narrowly reflexed; alt. about 80 mill. *bronni.*

## bb. Lip broadly reflexed, alt. 108–153 mill.

c. Compact, ovate, columella rather short, outer lip vertical, *ovatus.*



- cc. Elongated; columella very long, straight; outer lip sloping, *grandis*.
- aa. Peristome white or nearly so.
- b. Aperture less than half shell's length, short, wide below, outer lip dentate, *auritus*.
- bb. Aperture over half the length.
- c. Outer lip broadly reflexed.
- d. Aperture narrow, outer lip broadly reflexed, subvertical; parietal callus thin-edged, spreading broadly low on umbilical tract; surface malleated, *chionostomus*.
- dd. Aperture wide below; outer lip sloping, parietal callus not broadly spreading below; surface with low spiral cords, *gummatus, intercedens*.
- cc. Outer lip narrow, thickened, not reflexed, evenly arcuate; form short-oval; surface finely malleated in diamond-pattern, *oosomus*.
- III. Earlier whorls with even, close, fine rib-striae throughout.
- a. Spire regularly tapering; whorls moderately convex.
- b. Spire conical, moderately long and acute.
- c. Peristome rose-color, shell brownish, *oblongus* and *v crassus*.
- cc. Peristome and shell-substance white, *v. tobagoensis*.
- bb. Spire short, apex very obtuse, peristome rose, *capillaceus*.
- aa. Whorls convex, the antepenultimate bulging; lip white, *lichtensteini*.
- IV. Earlier whorls with tubercles at the suture.
- a. Lip-ends not convex above; alt. 50-60 mill. *rosaceus*.
- aa. Lip-ends converging above.
- b. Suture of last whorl crenulated, color flesh-buff, lip reflexed.
- c. Form stout, ovate; alt. 30-38 mill. *crenulatus*.
- cc. Form slender; alt. 27, diam. 16 mill. *crenellus*.
- bb. Suture of last whorl hardly crenulated; whitish; lip narrow but much thickened. *pachychilus*.
- V. Earlier whorls without riblets or crenulation.
- a. Shell slender, the lip flatly reflexed, *bridgesi*.
- aa. Shell globose-ovate, lip narrow.
- b. Alt. 25-30 mill. *lutescens*.
- bb. Alt. 42 mill. *globosus*.

The unfigured *B. cacopatensis* Pfr. is not included in this key.

*S. POPELAIRIANUS* Nyst. Pl. 1, fig. 1; pl. 2, fig. 1; pl. 3, fig. 10.

Shell very large, solid, rimate, ovate-conic; spire subregularly tapering, the penultimate whorl somewhat bulging, last whorl depressed on the back. Dark reddish-brown or rich chestnut with narrow darker streaks and a lighter margin below the suture; the earlier whorls dull reddish, apex white. Surface covered with a strong cuticle, shining. Nepionic shell distinctly marked, with 4 whorls, *sculptured with strong narrow radial riblets*, which on fourth whorl become obsolete toward suture below. Succeeding whorls 2, having growth-wrinkles and a dense but rather irregular spiral granulation which fades out upon last whorl, which is more coarsely sculptured by lengthwise wrinkles and has generally more or less coarse spiral malleation. Sutures deep, the last decidedly more oblique.

Aperture about half the shell's length, trapezoidal, white with a livid tint within. Outer lip well reflexed, white (or light-brown edged), convexly curved; columella white, reflexed, and *in the immediate vicinity of its insertion* spreading upon the whorl and continued in a strong white callus across the parietal wall. Near the upper termination of parietal callus there are usually one or two low callous nodules.

Alt. 136, diam. 85 mill. (specimen). Nyst's figure measures 155 x 98 mill.

*Quito* (Isern), *Bodega* (Paz), and *Napo* (Martinez), *Equador*; *Bolivia* (Castelnau, doubtful).

*Bulimus popelairiana* NYST, Bull. Acad. Roy. de Bruxelles, xii, (2), p. 151, pl. 3, f. 5 (1845).—*Bulimus popelairianus* PFR., Monographia ii, p. 20.—HIDALGO Mol. Viaje al Pacif. p. 46, pl. 3, f. 7.—MARTENS, Novit. Conch. v, p. 3, pl. 139, f. 1, 2; pl. 140, f. 1, (with varieties).—*Bulimus maximus* HUPE in Castelnau's Anim. nouv. ou rares rec. dans l'Amér. du Sud, Moll., p. 24, pl. 4, f. 1.

The generally larger size, more bulging penultimate whorl, broader contour and larger aperture seem to be the chief differences between this species and *S. maximus* Sowb.

A young specimen of var. *thammianus* measures at time of extrusion from egg (marked by a broad brown stripe in this species) 41 mill. long. It is finely granulated as well as ribbed. First whorl nearly planorboid, smooth; last whorl ribbed only above. Whorls 4.



Typical *popelairianus* Nyst. Pl. 1, fig. 1.

Last whorl dark red-brown, without malleation. Aperture slightly over half the shell's length, without tubercle on parietal wall. See above for localities.

Var. *thammianus* Martens. Pl. 9, fig. 49; pl. 8, figs. 42, 43.

Last whorl dark yellowish-brown, with numerous malleations; a light yellow band at suture; cuticle lost in spots or streaks, rarely zigzags. Aperture half the shell's length, with a callous tubercle above on parietal wall. Lip yellow-edged.

Length 147, diam. 89; apert. long 76, width 57 outside, 44 inside peristome.

Length 126, diam. 73; apert. long 68, width 50 outside, 36½ inside peristome.

*Chancamayo, in the Amazon drainage of Peru* (Thamm); *Upper Magdalena valley in New Granada, and at Huallaga* (Dohrn coll.); *Marmato, New Granada* (Bland, in coll. A. N. S.); *Nanegal, in the wooded region of the western Cordillera of Quito* 1000–2000 meters, and *St. Ines, on the Rio Pastaca, 1244 meters alt., Ecuador* (Stübel)

*Bulimus garcia-moreni* Miller, Mal. Bl. xxvi, 1878, p. 172, and (n. F.) i, 1879, p. 118, pl. 4, f. 1a, b, is undoubtedly a synonym, as von Martens has already maintained (Conchol. Mittheil. i, p. 157). The original figure of shell and egg are copied on my pl. 8, figs. 42, 43. It is common on the rivers of the Province Esmeraldas, according to Wolf. "It seems to occur throughout entire western Ecuador, up to 3000 feet, alt., and is an esteemed edible, like *Helix pomatia* in Europe."

Var. *dohrnianus* Martens. Pl. 3, fig. 10.

A specimen in Dohrn's collection is conspicuously compressed dorso-ventrally; cuticle lost in broad spirals; mouth somewhat longer, parietal wall proportionally steeper sloping, without tubercle. Length 145, diam. 95; aperture 83 long, 58 broad measured outside, 44 inside peristome. Upper whorls much eroded, but showing in the better preserved places the close riblets of this species. Locality unknown.

Var. *connectens* Martens. Pl. 2, fig. 1.

Suture less deep; parietal wall steeper, peristome thicker; approaching *B. valenciennesi*, but showing the close riblets on earlier

whorls, large size and equal rounding out of the outer lip of this species. Cuticle lighter brown-yellow, and lost in large tracts or streaks. Columellar margin closely appressed, callous tubercle strongly developed.

Length 141, diam. 89; apert., length 81, width 57 (40 inside).

Length 134, diam. 81; apert., length 71, width 51 (39 inside).

Length 131, diam. 78; apert., length 72, width  $51\frac{1}{2}$  (40 inside).

*Upper course of the Magdalena R., New Granada.*

*S. MAXIMUS* Sowerby. Pl. 4, fig. 5.

Shell elongated, the last whorl narrowed above, swollen sack-like below; suture constricting. Brownish-yellow with dark streaks. Aperture slightly less than half the shell's length; columella sub-vertical, broadly expanded and appressed at the umbilical region, and meeting the parietal wall at a smaller angle ( $135^\circ$ ) than in *S. popelairianus*.

Alt. 130, diam. 67; alt. aperture 64 mill.

Alt. 135, diam. 73; alt. aperture 63 mill.

*Bolivia, at the foot of the eastern Cordillera at Sta. Rosa, near Santa Cruz della Sierra, and in the country of the tribe Yuracarés in humid forests (Orbigny); On the Rio Tocantins, in the neighborhood of Baião, N.-E. Brazil (Stübel).*

*Cochlogena maxima* SOWERBY, appendix Tankerv. Catal. p. vii, (1825, unrecognizable description).—*Bulinus maximus* SOWB., Conch. Illustr., f. 63 (1841?).—*Bulimus maximus* RVE., Conch. Icon. v, pl. 51, f. 337 (1848).—PFR., Monogr. ii, p. 19.—MARTENS, Novit. Conch. v, p. 4; Conch. Mittheil. i, p. 157.—*Bulimus kremnoicus*. d'ORB., Voy. dans l'Amér. Mérid. p. 300, pl. 35, f. 1, 2, and var. f. 3.—*Helix kremnoica* d'ORB., Syn. p. 15.—(Not *B. maximus* BLD. in C. B. Ad. Contrib. Conch. no. 11, p. 229, = *B. popelairianus* var. *thammianus*).

This rare species has the sharp, close riblets of earlier whorls, and the dense granulation of those following, as in *S. popelairianus*; but it is apparently quite distinct in the *smaller angle made by columella with parietal wall*, and the much broader spread of the reflexed columella upon the adjacent umbilical tract of body-whorl. It is also rather more elongate with smaller mouth; and there seems to be no callous nodule upon the upper part of parietal wall, such as occurs in *S. popelairianus*.



? Var. *kremnoicus* d'Orbigny, (pl. 5, fig. 28). Two of d'Orbigny's figures of *B. kremnoicus* agree with *maximus*; the third is decidedly more elongated with smaller mouth. If this proves to be racially constant, the name var. *kremnoicus* may be retained for it.

S. HUASCARI Tschudi. Pl. 5, fig. 27.

Shell elongated, the suture hardly constricting, the last and greater part of the next earlier whorl dark yellow-brown, strongly wrinkle-striate, with more or less numerous malleations and traces of fine spiral striæ; last whorl not swollen sack-like beneath. Aperture half the shell's length or a little less, its breadth (measured inclusive of the rather narrow columellar reflection) three-fifths the length. Angle between columella and parietal wall  $140^{\circ}$ . (Martens).

Alt. 105, diam. 53 mill. (Tschudi).

Alt. 99, diam. 51; apert. alt. 52, width 32 (inside 24).

*Eastern spur of the Peruvian Cordillera between Chanchamayo and Tullumayo* (Tschudi); *Chanchamayo* (Thamm).

*Bulimus huascari* TSCHUDI, Archiv f. Naturg. xviii, 1852, p. 186.—MARTENS, Novit. Conch. v, p. 5, pl. 141, f. 3, 4.—*B. maximus* var. *minor* PFR., Monogr. ii, p. 19, and iii, p. 303.—*B. lacunosus* Orb., REEVE, C. Icon. v, f. 208.—HUPE in Castelnau, p. 27, pl. 5, f. 1.—*B. sanctæ Crucis* Orb., MARTENS, Mal. Bl. xiv, p. 138, 1876.

Seems closely allied to *S. maximus*, but is smaller with less gibbous base.

S. SANTACRUZII d'Orbigny. Pl. 4, fig. 3.

Shell *narrowly ovate-conic with rather slender, and comparatively acute spire*. Cuticle dark brown or chestnut, the surface when it is removed purplish-red, with a white band below the suture. Spire regularly tapering; suture somewhat constricting, the latter part of penultimate whorl rather bulging. Nepionic shell composed of  $3\frac{1}{2}$  whorls, the first one smooth, the others with strong narrow radial riblets, which on the latter half of the last nepionic whorl hardly reach the suture below, and *become unequal, every second, third or fourth riblet being stronger and much longer than those intervening*. Following whorls less than two, irregularly wrinkle-striate; penultimate and antepenultimate whorls finely spirally granulated.

Aperture slightly more than half the shell's length, narrowly ovate-pear-shaped; outer lip evenly curved, narrowly subreflexed and thickened, white; columella concave with a weakly convex

spirally entering fold above; margin gradually expanding and spreading in a thin callus over the parietal wall.

Alt. 83, diam. 43 mill.; apert., alt. 44, width 32 mill.

Bolivia, provinces Yungas and Ayupaga, on the northeastern spur of the eastern Cordillera (Orb.); Amable Maria (Jelski) and Prov. Carabaya, Peru (Raimondi); Northern Peru (Phil. Acad. Colln.)

*Helix santa Cruzii* d'ORB., Syn., p. 15.—*Bulimus santa Cruzii* d'ORB., Voy. dans l'Amér. Mérid. p. 302, pl. 38, f. 1, 2.—*Bulimus santacruzensis* PFR., Novit. Conch. iii, p. 416, pl. 95, f. 1, 2.—*B. sanctæ Crucis* BECK, Index, p. 52.—MARTENS, Novit. Conch. v, p. 6.

The form is slimmer than *B. huascari*, especially in the spire. The upper part of the columella passes with hardly an angle into the parietal wall. The riblets of the latter part of the nepionic shell are notably unequal in length.

S. LACUNOSUS d'Orbigny. Pl. 6, figs. 31, 32.

Shell imperforate, elongated, inflated, thick, longitudinally very minutely striated, transversely subgranulose; reddish-brown, with darker longitudinal streaks. Spire conic, subacuminate, the apex obtuse, strongly striated. Whorls  $5\frac{1}{2}$ –6. Aperture long, whitish; lip thick, whitish, reflexed; columella somewhat twisted, thick.

Length 85, diam. 38 mill. (Orb.).

Tutulima, in the north-eastern part of province Cochabamba, Bolivia, at the bottoms of heavily wooded ravines.

*Helix lacunosa* ORB., Syn., Mag. de Zool., 1835, p. 15.—*Bulimus lacunosus* ORB., Voy. dans l'Amér. Mérid. p. 302, pl. 36, f. 5, 6.—PFR. Monogr. ii, p. 28.—MARTENS, Novit. Conch. v, p. 7.

Evidently differs from the last in being heavier with broader, thicker lip and slenderer form. I have not seen the species.

S. MATHIUSII d'Orbigny. Pl. 7, figs. 4, 5; pl. 9, fig. 45.

Shell rather small for the group, solid, ovate-oblong, the spire short, thick and with rounded vertex. "Uniform dark purple-brown, summit violaceous, suture paler;" specimens without cuticle are purplish-brown on the spire with a wide sutural white band, becoming lighter on body-whorl, whitish at base. Whorls 5, the earlier  $3\frac{1}{2}$  forming the nepionic portion, which has narrow radial riblets extending from suture to suture; following whorls with coarse, irregular longitudinal wrinkles; suture rather superficial. Aperture





ovate-pear-shaped, acute above; outer lip slightly expanded, much thickened, regularly curved below, straightened above, whitish; columellar lip concave below, passing gradually into the parietal wall above, and making no perceptible angle with it; broadly reflexed and adnate; parietal callus white and strong.

Alt. 60, diam.  $37\frac{1}{2}$  mill.; apert., alt. 37, width  $28\frac{1}{2}$  mill.

*Andes of Eastern Peru* (Matthews).

*Helix mathiusii* ORB., Guérin's Mag. de Zool. 1835, p. 16.—*Bulinus mathiusii* ORB., Voy. dans l'Amér. Mérid. p. 303, pl. 38, f. 3, 4.—*B. matthewsii* BECK, Index, p. 53.—PFR., Monogr. ii, p. 25; iv, p. 366.—MARTENS, Novit. Conch. v, p. 7.—? *Bulinus leucostoma* SOWB. P. Z. S. 1834, p. 141.—PFR., Monogr. ii, p. 23.—*B. mahogani* SOWB., Conch. Ill. f. 59.

The comparatively short, blunt, rounded spire is the most prominent feature distinguishing this species from the several preceding, with which it shares a pear-shaped mouth, continuous parieto-columellar lip, and the long, narrow ribbing of superior whorls.

The *B. leucostoma* of Sowerby is believed by Dr. von Martens to be identical. It is from the same collector (the botanist D. Matthews, locality Prov. Xagua, Peru), and is described by Sowerby as follows: "Shell ovate, ventricose, wider in front, obtuse behind; whorls 4, the first longitudinally subsulcate, the last large, smooth, olivaceous-brown throughout, the suture paler, crenulated; aperture oblong, acuminate behind, peritreme reflexed, white; length 2.6, width 1.4 inch." This species was afterward figured by Sowerby in the Conchological Illustrations, f. 59, as *Bulinus mahogani*.

Granting the identity of the forms described by Orbigny and Sowerby, the question of priority arises. Orbigny's description bears date July 1, 1835; Sowerby's, Dec. 9, 1834; but as it is known that the Proceedings of the Zoological Society appeared in print very long after the dates of the meetings, there is no conclusive evidence that the name *leucostoma* has precedence; and its subsequent disappearance from English literature renders its use inadvisable, even if identity with *mathiusii* were proved, unless its priority be demonstrated.

S. DURFELDTI Dohrn. Pl. 10, figs. 51, 52.

Shell long-elliptical, yellow-brown, the first whorl smooth; on the second whorl riblets appear, not crowded, becoming stronger on the third and first half of the fourth, and closer, narrower, somewhat

more as in *B. mathiusii*. Ground-color of these whorls is a rather reddish moderately dark brown, the sutural band narrow and yellowish, spiral striation only seen by strong magnification. On the fourth whorl the spiral striation is more distinct, the riblets change rapidly to close flat wrinkle-striae, and numerous spiral series of very small rounded granules appear, which continue to become more distinct upon the following whorls to the aperture. The last whorl and aperture are narrower below than in *B. mathiusii*, the suture appressed; peristome white, somewhat thicker, but not reflexed, the columellar margin less curved, parietal callus thicker. (*Martens*).

Length 70, diam. 30; apert. long 36, width 23 mill.

Length 67, diam. 32; apert. long 34, width 22½, inside 17 mill.

*Montana de Cuzco, Peru* (Dohrn).

*B. dürfeldti* DOHRN, Mal. Bl. x, 1863, p. 152.—PFR., Monogr. vi, p. 11.—MARTENS, Novit. Conch. v, p. 8, pl. 140, f. 4, 5.

Distinguished from the foregoing species by the granulation of the body whorl.

*S. HUPEANUS* Morelet. Pl. 8, fig. 40; pl. 9, fig. 44; pl. 15, fig. 23.

Shell oblong, rather thin, longitudinally striate-rugulose and all over most minutely granulose. Spire rather obtuse; whorls 5, subconvex, the last subventricose, a little depressed, equal in length to the spire. Aperture oblong-oval; peristome thickened, reflexed; columella somewhat twisted. Greenish-brown, the spire rose-tinted, sutures pale; aperture and lip white.

Alt. 68, diam. 34 mill. (*Hupé*).

*Peru* (Castelnau); *Valley of Vilcabamba* (Angrand); *Valley of Lares* (Raimondi).

*Bulimus castelnaui* HUPE in Castelnau Exped. Moll., p. 27, pl. 4, f. 2 (1857).—MARTENS, Novit. Conch. v, p. 9. (Not *B. castelnaui* PFR., 1856).—*B. hupeanus* MOREL., Séries Conch. III, 1863, p. 170.—PFR., Monogr. vi, p. 11.—*Bul. leucostomus* PFR., Novit. Conch. iii, p. 409, pl. 94, f. 1, 2.

In many respects similar to *B. dürfeldti*, especially in the upper whorls, but the riblets somewhat weaker, so that it is doubtful whether the species may not technically be placed in the group of *oblongus*. Moreover the whole shell is thinner than in *dürfeldti*, the mouth proportionally larger, the peristome much thinner and the parietal wall more steep. The sculpture of the last whorl also con-



sists, in the specimen in Dohrn's collection, of numerous spiral series of very small granules; these granules are a little larger and follow one another closer than in *dürfeldti*.

Length 69, diam. 36; length of aperture 38, width 25 outside, 19 mill. inside.

Whether *B. dürfeldti* is specifically separable from this species must be decided by the examination of more material. Not having seen this species, the above observations are taken from von Martens' monograph.

*S. COCAPATENSIS* Pfeiffer. *Unfigured.*

Shell imperforate, ovate-oblong, solid, very minutely decussated; violaceous-fleshy under a greenish-tawny cuticle; spire convex-conic, the apex obtuse; suture white, irregular; whorls  $5\frac{1}{2}$ , the upper ones radially ribbed and most minutely granulated, the following very obliquely descending, a little convex; the last whorl about equal in length to the spire, base rounded. Columella receding, slightly arcuate; aperture subvertical, acuminate-oval, pearly within; peristome thickened, narrowly expanded, the margins joined by a shining callus, columellar margin dilated, adnate.

Alt. 67, diam. 30 mill.; aperture, long  $55\frac{1}{2}$ , width 15 [?] (*Pfr.*).

*Cocapata*, Bolivia (Bridges, in Mus. Cuming).

*Bulinus cocapatensis* PFR., P. Z. S. 1855, p. 115; Monogr. iv, p. 467; vi, p. 11.

At first glance it looks like *B. rosaceus*, but has different sculpture, obliquely descending suture, etc. (*Pfr.*).

*S. GRANULOSUS* Rang. Pl. 6, fig. 33.

Shell ovate-oblong, solid; ground-color brown above, white below, under a thin yellow cuticle with darker longitudinal streaks. Nepionic shell of  $3\frac{1}{2}$  whorls, the first planorboid, smooth, the next with equal, narrow, spaced riblets, which on latter half of last nepionic whorl do not extend to suture below; post-embryonic whorls 2, with slight growth-lines. Last  $2\frac{1}{2}$  whorls densely, minutely granulated throughout, the granules oblong in spiral series, equally developed over the whole body-whorl. Spire regularly tapering; last whorl regularly elliptical, somewhat flattened above.

Aperture half the shell's length, narrowly ovate-pear-shaped, acute above, white within; outer lip hardly expanded, much thickened, rose-pink, straight above, regularly curved below: columella

concave below, passing into a long, oblique feeble entering fold above; parietal callus heavy, pink.

Alt. 89, diam. 48 mill.

Alt. 89, diam. 55 mill.

*Islote de los Ratones (Isle of Rats) near island of Santa Catalina, Brazil (Paz and Martenez).*

*Helix granulosa* RANG, Ann. des Sci. Nat. xxiv, 1831, p. 53, pl. 2.  
—*Bulimus granulosa* BECK, Index, p. 58.—REEVE, Conch. Icon. v, f. 209.—PFR., Monogr. ii, p. 22.—HIDALGO, Mol. Viaje al Pacif. p. 51.—MARTENS, Novit. Conch. v, p. 10.—*Helix oblonga* FER., Hist. pl. 145B, f. 1.

Distinguished from all the preceding by its rose-pink lip and columella. The beautiful granulation of the whole body-whorl, narrowly pear-shaped aperture, and long, spaced folds of earlier whorls (as in the foregoing group of species), will sufficiently separate *B. granulatus* from all the species following.

*S. VALENCIENNESI* Pfeiffer. Pl. 7, fig. 6.

Shell very large, solid, and strong, ovate; *last whorl having numerous low, indistinct spiral cords*, the surface between them often malleated; penultimate whorl, or part of it, with very minute spiral granulation or pits from erosion of granules. Nephritic whorls  $3\frac{1}{2}$ , the first planorboid, smooth, next with fine, weak, radial riblets. Spire regularly tapering, apex slightly obtuse; post-embryonic whorls  $1\frac{1}{2}$ , yellowish-brown with darker streaks, and *zigzag markings* of light yellow deciduous cuticle, or whitish by loss of the cuticle. Aperture short-pyriform, purplish-brown within; lip whitish or brownish, hardly expanded, very thick; columellar margin thick, concave; parietal wall covered with a strong callus, in adults bearing a callus lump near the upper angle of aperture.

Alt. 140, diam. 86 mm.

Alt. 115, diam. 78 mm.

*Interior of Brazil.*

*B. valenciennesii* PFR., Symbolæ ii, p. 52; Monogr. iii, p. 303; Conchyl. Cab. pl. 68, f. 3.—MARTENS, Novit. Conch. v, p. 10.—PHILIPPI, Abbild. ii, p. 123, pl. 5, f. 1.—*Bul. popelairianus* REEVE, C. Icon. pl. 34, f. 204.—*Bul. fulguratus* VALENC., in Mus. Paris. and BECK, Index, p. 53 (undescribed).



The zigzag markings of light yellow cuticle or denuded, are characteristic. This species, like *B. popelairianus*, is depressed on the back. It differs conspicuously from that species in the weak sculpture of the earlier whorls. The last whorl when examined with a strong lens, shows an excessively fine, dense longitudinal striolation, somewhat less distinct than in *B. proximus*, but of the same character. This is an excellent distinctive character of these species, which does not occur in the *popelairianus-granulosus* series, nor indeed in any other group of *Borus*.

*S. CANTAGALLANUS* Rang. Pl. 16, fig. 24; pl. 17, figs. 28, 29.

Shell large, ovate-conic, olivaceous-brown with some dark streaks on body whorl, becoming dark purple on the spire; the suture bordered by a wide light band. Nepionic whorls with weak, spaced radial riblets; penult. and next earlier whorls with spiral series of minute granules; last whorl showing coarse low, inconspicuous spiral cords especially above, and under a very strong lens seen to have an excessively dense, fine sculpture of wavy longitudinal anastomosing raised lines. Aperture over half the shell's length, pear-shaped, purplish-tinted inside; outer lip well curved, narrowly reflexed, thickened, white. Columella white, dilated above; parietal callus strong, white, generally with a callus nodule above.

Alt. 98, diam. 61 mill.

Alt. 89, diam. 55 mill.

*Southern Brazil; neighborhood of Cantagallo, Prov. Rio Janeiro (Rang), and forest region generally from Rio to Bahia.*

*Helix cantagallana* RANG, Ann. Sci. Nat. xxiv, p. 50 (1831).—*Bulinus cantagallanus* BECK, Index, p. 53.—FISCHER, Exped. Sci. du Mexique, Etudes sur les Moll. Terr. et Fluv., i, p. 469, pl. 22, f. 12-17, anatomy.—DESIL. & DE FOLIN, Actes de la Soc. Linn. Bord. xxv, p. 483, plate (living animal).—MARTENS, Novit. Conch. v, p. 12, pl. 138, f. 1, 2.—*B. accelerans* MARTENS, Malak. Bl. xiv, 1867, p. 137.—PFR., Monogr. vi, p. 10.—*Bulinus proximus* SOWB., Conch. Illustr. f. 102 (1833).—*Bulinus proximus* PFR., Monogr. ii, p. 20.—REEVE, C. Icon. f. 607.—MARTENS, Novit. Conch. v, p. 11.—*Bul. terrestris* SPIX=*B. corrugatus* WAGN., Test. Bras., p. 5, pl. 6. f. 1, (Young). Conf. DOHRN, Jahrb. M. G. x, p. 347.

The sutural light band is conspicuous. The apical folds are as in *B. valenciennesii*, but it lacks the zigzag markings of that species. The micro-sculpture of the last whorl is peculiar and very charac-

teristic. I have four specimens of this species before me, and from a study of them and the literature, it seems to me impossible to make any separation between *cantagallanus* and *proximus*.

Var. INTERCEDENS Martens. Pl. 10, figs. 53, 54.

Shell ovate-elliptical, the larger part of the penultimate whorl distinctly granulated, but gradually passing from dark reddish-brown to brown-yellow, the last whorl evenly convex, with numerous malleations or hammer-stroke-like impressions, forming spiral series; shining brownish-yellow, with numerous narrow darker streaks. the suture less oblique than in *ovatus*, whitish, an indistinctly defined band under it gamboge yellow. Aperture pear-shaped, somewhat narrowed below; peristome thick, pure white; outer lip beautifully curved; columellar margin arising bow-shaped from the basal margin, and passing obliquely into the parietal wall above, here being flattened, not cord-like; outside edge thick, appressed. Parietal wall with a thick porcelain-white deposit, sharply defined outside as in *B. valenciennesi*, not so thin and outwardly attenuating as in *ovatus*; having in the superior angle a nodule-like swelling on its edge. Length 110, breadth 69, greater diam. 72, lesser 55½ mill.; aperture, length 63½, breadth 42; measured inside cavity, length 57, breadth 31 mill. (Martens).

*Bahia, Brazil*; 1 specimen (Fokkes coll.).

*Bulimus intercedens* MART., Novit. Conch. v, p. 14, pl. 141, f. 1, 2.—PFR., Monogr. vii, p. 13.

It is not possible for me to recognize any described species in this specimen. While the surface features of the last whorl are very similar to *B. ovatus*, the general form is between that species and *B. cantagallanus*; the slender form of the apex, and the characters of the peristome agree better with the preceding species than with *ovatus*. (Martens).

Compare *S. gummatum* Hidalgo.

*S. GUMMATUM* Hidalgo. Pl. 11, figs. 57, 58, pl. 19, f. 40; pl. 20, f. 41.

Shell subimperforate ovate-attenuate, solid, rather thick. Pale rose, under a varnish-shining fulvous epidermis irregularly marked with chestnut streaks. Spire slender, conic, somewhat obtuse; suture distinct; whorls 5½, slightly convex, rapidly increasing, the first obsoletely radially costate, the rest longitudinally somewhat



wrinkled, with slight spiral cords, subregularly squarely malleated; penultimate whorl flattened on the left side, the last whorl ventricose, widened transversely, subdepressed on the back, slightly ascending in front. Aperture vertical, acuminate above, subdilated below, five-ninths the shell's length, inside whitish-blue; peristome thickened, white, narrowly reflexed, margins joined by a rather thick callus which has a tubercle above; right margin slightly flexuous, columellar margin oblique, reflexed, adnate, covering or nearly covering the perforation.

Length 105, diam. 56 mill. (*Hid.*).

*Rio Janeiro (Paz).*

?? *Bulimus cantagallanus* PFR., Monogr. iv, p. 365 (1859), not of Rang.—*Bulimus gummatius* HIDALGO, Journ. de Conch., Cat. Coq. Amér. Mérid. p. 41 (1870); Viag. al Pacif. p. 49, pl. 4, f. 1; pl. 5, f. 1.

Three specimens with the locality "Brazil" only, are before me, two of which are figured on plates 19 and 20. It is unquestionably a species distinct from *B. ovatus* v. *chionostomus*, being distinguished by the more conic spire, closer and narrower folds of early whorls, aperture distinctly wider and more truncate below, the outer lip not vertical but sloping outward; columella less vertical, being oblique and passing without distinct angle into the parietal wall. It is also less expanded, not suddenly spreading as in *ovatus*. Moreover, the callous lump of the parietal wall is strongest at the edge of the parietal callus, which is not thinned out as in *ovatus*. For the rest, there are no very decided differences, although the cuticle in *gummatius* is of a varnish or gummy brilliancy, the spiral cords are quite obvious, and the malleation is not of the pattern seen in *ovatus* and is less pronounced.

*S. OVATUS* Müller. Pl. 12, figs. 60, 61.

Shell large, solid, oval; chestnut-brown with numerous darker and lighter streaks; surface glossy. Nepionic shell of 4 whorls, the first smooth, planorboid, the following radially costate, costæ separated, short, and minutely spirally granulate, post-nepionic whorls  $1\frac{2}{3}$ , at first densely granulated and slightly malleated, the last whorl without granulation, glossy, finely malleated all over.

Aperture much exceeding half the length of shell, acuminate-ovate, narrow and acute above, narrowly rounded below; peristome pink-edged; outer lip curved at upper insertion, then rather straight,

with a slight thickening within, above the middle; columella short, very concave and pink below, broadly spreading in a translucent-white callus over the umbilical tract and parietal wall, usually with a thickening (hardly a lump) above, remote from edge of callus.

Alt. 128, diam. 80; aperture alt. 69, width 54 mill.

Alt. 116, diam. 62; aperture alt. 59 width 44½ mill.

*Rio Janeiro* (Martens *et al.*); *New Freiburg* (Bescke); *St. Sebastiano, on the coast S. of Rio* (Spix); *Prov. Bahia* (Spix); *Bahia* (Anthony); *near Petropolis* (A. D. Brown).

*Helix ovata* MULLER, Hist. Verm. ii, p. 85.—*Helix ovalis* GMEL., Syst. Nat. 13, p. 3637.—*H. (Cochlogena) ovata* FER., Hist. pl. 146, 147.—*Bulimus ovatus* BRUG., Encycl. Méth. i, p. 318.—PFR., Monogr. ii, p. 19.—REEVE, C. Icon. f. 212.—MARTENS, Novit. Conch. v, p. 14.—HIDALGO, Viaje al Pacif. p. 47.—*B. ovum* H. & A. AD., Gen. Rec. Moll. ii, p. 146.—*B. hæmastomus* SWAINS., Malacol. p. 178, fig. 26.—*Strophocheilus hæmastomus* SPIX, Test. Brasil. p. 12, pl. 11, f. 1.

This is one of the best-known species, readily recognized in typical specimens by the strong, glossy, rich dark chestnut epidermis with numerous darker and yellowish streaks, the narrow aperture, rather straight, pink or pink-edged outer lip, translucent edged parietal callus, always thinned-out at the edge, etc. Moreover, the lip is broadly reflexed, recurved; and the columella is narrowly, abruptly curved toward its base, and the broad spread of its reflexion extends lower than in other forms. A very sparse, minute granulation sometimes extends over the earlier half of the body-whorl.

Var. *chionostomus* Mörch. Pl. 21, fig. 49.

Form, sculpture and marking exactly as in the type, or shell somewhat more lengthened; but cuticle thinner, yellow with dark stripes; peristome snow-white (whence the name); shell-substance under the cuticle white, the earlier whorls white or delicate pink.

*Macahé, Brazil* (Paz, Martinez).

*Bulimus chionostoma* MORCH, Catal. Yoldi, (1852), p. 27 (no description; refers to "Variat rarior peristomate albo" Pfr., Monogr. ii, p. 20).—*B. ovatus* var. *chionostomus* MART., Novit. Conch. v, p. 15.

I cannot follow von Martens in quoting here Férussac's plate 160, f. 11, 12, without a "?". Those figures are by no means typical *chionostomus*. A number of specimens of this white-mouthed variety



are before me, showing practically the same characters, except in color, as *S. ovatus*. The striping of these is like *S. gummatus* Hid., but the form of the mouth is exactly as in *ovatus*, not obtuse below as Hidalgo's species is.

*S. GRANDIS* Martens. Pl. 13, fig. 68.

Shell imperforate, ovate-oblong, subrugose-striate, somewhat shining; tawny-chestnut, paler at the suture. Whorls 6, slightly convex, the first small, white, with impressed points, second and third sculptured with rather remote strong perpendicular ribs, chocolate-brown, white at the suture; the last whorl deeply descending in front, convex at the base. Aperture trapezoidal-oblong, subvertical, flesh-whitish inside; peristome thickened, narrowly reflexed, bright rose color; outer margin receding above; columellar margin perpendicular, whitish above; parietal callus thin, whitish. Alt. 153, greater diam. 83, lesser 62 mill.; aperture, length including peristome 92, breadth 45 mill. (*Mart.*).

*Descalvado, Prov. Mattogrosso, Brazil (Rohde),*

*B. grandis* MARTENS, Sitzungsberichte naturforsch. Freunde in Berlin, 1885, p. 148; Conchol. Mittheil. iii, p. 9, pl. 39.

This species is nearly allied to *B. ovatus* in characters of aperture and upper whorls, but differs much in the general contour, the last whorl embracing a much smaller portion of the preceding, is of less circumference, and falls more toward the mouth. In consequence, the aperture is notably longer and in comparison narrower; the outer lip for two-thirds of its length slopes outward, while in *B. ovatus* only the upper third so slopes, the rest falling vertically; the thickening in the middle of the outer lip usually seen in *ovatus* is lacking also. The columellar margin is decidedly longer and almost straight. As only one specimen was secured, it may be only an individual variation of *ovatus*; but it is more likely to prove to be geographically sundered, as no true *ovatus* is yet known from this Province. (*Mart.*)

*S. AURITUS* Sowerby. Pl. 12, fig. 62; pl. 16. fig. 26.

Shell subimperforate, ovate, solid, rugose-striate, under a lens most minutely granulated; brown-olivaceous; spire convex-conic, rather obtuse. Whorls 5, the upper closely striate, rather flattened, the last two swollen, closely plicate at sutures, the last whorl slightly shorter than the spire, subcompressed at base; columella somewhat

straightened, slightly receding, white. Aperture subvertical, sinuate-oval; peristome thickened, narrowly expanded, whitish, the right margin somewhat straightened, with a tubercular thickening inside. Length 100, diam. 48 mill.; apert. measured inside, alt. 40, diam. 20 mill. (*Pfr.*).

*Bahia, Brazil* (Sowb.).

*Bulinus auritus* SOWERBY, Conch. Illustr. f. 76.—*Bulinus auritus* PFR., Monogr. ii, p. 25; iii, 304; iv, 366; vi, 11.—*B. ovatus white-lip dwarf var.*, REEVE, Conch. Icon. pl. 89, f. 212b.

Evidently belongs to the *ovatus* group, but differs from that species in the smaller mouth and white lip, the columellar reflexion not continuing so far downward, etc. The strongly developed tubercle within the outer lip is characteristic.

I refer to this species a pair of solid, heavy shells before me collected by Anthony on Agassiz's expedition to Brazil, one of which is figured on pl. 16, fig. 26. Traces only of a yellow, streaked cuticle remain. The aperture is under half the shell's length, wide and truncate below; outer lip with a median somewhat lobed callous tooth; columella with a lump above. Alt. 84, diam. 50 mill.; alt. of aperture 40 mill.

*S. oosomus* Pilsbry, n. sp. Pl. 18, figs. 32, 33.

Shell short-oval, globose, solid and strong, with thin straw-yellow cuticle having occasional narrow brown streaks, the shell-substance under it white toward the base, reddish-brown above, with a wide whitish sutural band. Spire short; sutures deeply impressed, the last one oblique, the surface below it somewhat "puckered" or wrinkled as in *B. ovatus*. Whorls  $5\frac{1}{2}$ , the first planorboid, smooth, white, the second having strong curved radial ribs separated by intervals of about their own width; and about the middle of the third whorl these ribs become more spaced and shorter, not extending to the suture below; the surface at the same time becoming densely granulated spirally. Post-nepionic whorls  $1\frac{1}{2}$ , at first finely wrinkle-striate and densely granulated. Surface of body-whorl finely malleated in obscure diamond-pattern, and covered with a minute sparse and irregular granulation.

Aperture narrow-ovate, subvertical, bluish-white within; peristome white, hardly expanded, but considerably (3 mill.) thickened on the face and within; outer lip evenly arched; columella arched below, oblique above, reflexed and appressed over the umbilical



tract, and spreading over the parietal wall in a heavy white callus with strongly defined outer edge. Alt. 81, diam. 54 mill.; aperture alt. 42, width outside col. callus and perist. 37, width of cavity 24 mill.

*Brazil.*

This species evidently belongs to the group of *S. ovatus*, but differs from that species in the deeper sutures and more shortly ovate form; and although the lip is considerably thickened, indicating a fully mature shell, it is scarcely in the least expanded.

*S. BRONNI* Pfeiffer. Pl. 16, fig. 27; pl. 15, figs. 18, 19.

Shell ovate-elliptic, rather thin but strong, very dark rich brown with darker streaks and a yellowish subsutural band, the apex whitish, or reddish-brown. Nepionic whorls  $3\frac{1}{2}$ , the first  $1\frac{1}{2}$  smooth, the following whorl with *very strong radial folds* narrower than their intervals, and extending from suture to suture, the next whorl with the folds coarser, more spaced and rather short. Post-nepionic whorls  $1\frac{1}{2}$ – $1\frac{3}{4}$ , very densely and finely spirally granulate, the granulation becoming obsolete on last whorl and quite absent from its latter two-thirds; body-whorl having indistinct low spiral cords, and some malleation.

Aperture much over half the shell's length, narrowly pear-shaped, fleshy within; peristome *narrowly reflexed, recurved, pink*; outer lip rather straightened; basal lip deeply arched; columella straight, pink, reflexed in a thin, subtransparent, faintly bluish-pink parietal callus. Alt. 79, diam. 46 mill.; apert., alt. 48, width 31 mill.; width inside peristome and columella, 21 mill.

*Brazil.*

*Bulimus bronni* PFR., Zeitschr. f. Malak. 1847, p. 31; Monogr. ii, p. 22; Conchyl. Cab. p. 254, pl. 69, f. 1.—MARTENS, Novit. Conch. v, p. 16.—*B. browni* ADS., Gen. Rec. Moll. p. 146.—*Helix ovata* var. FER., Hist. pl. 145B, f. 2.

This species is constantly smaller than *S. ovatus*, the lip narrower, and the folds of earlier whorls stronger. There is considerable variation in the degree to which the minute granulation extends upon the body-whorl, von Martens mentioning a specimen in which the granulation extends to the aperture. The folds of early whorls are stouter than in *S. granulosus*, the mouth longer, and the columella does not extend upward in a convex fold as in that species.

S. OBLONGUS Müller. Pl. 14, figs. 70, 71, 72, 73.

Shell ovate, conic and acuminate above, solid; sutures not very oblique. Color dull isabelline or brownish under a very thin, deciduous brownish cuticle, usually in large part lost in adults. Whorls 5 $\frac{1}{4}$ -7. *Nepionic shell of 4 whorls, very regularly and closely rib-striate*, the last one or two granulated; post-nepionic growth over 2 whorls, more irregularly striated, last whorl not granulated, wrinkle-striate.

Aperture ovate, whitish within; *peristome and parietal callus rose-red*. Outer lip regularly arched, reflexed; columella slightly concave, reflexed in a broad, projecting, thin-edged, strong callus, which spreads above over the parietal wall.

Alt. 100, diam. 59 mill. (average specimen).

Alt. 132, diam. 76 mill. (specimen in coll. Johnson).

*Barbados, St. Vincent, Tobago, Trinidad; Puerto Cabello, Venezuela; Cucuta, Santa Ana, near Honda, New Granada; Mocamba, Miobamba, Para, etc., Brazil* (coll. Acad. Phila.); *Central Paraguay* (Borelli) *U. S. of Columbia, region of Muzo, at 600-800 meters; in the Magdalena valley, 500 meters; and near Ibaguë in the mountain region of Columbia, 1280 meters; Puente de Pandi, 779 meters; also on the Rio Tocantins near Baiao, N.-E. Brazil, 5 meters above the sea* (Stübel); *Corumba. Prov. Matto Grosso* (Coll. Johnson); *Santa Anna Valley Peru* (Angrand). *Extends from New Granada and Cayenne to Rio Grande do Sul and Uruguay, as far west as the eastern slope of the Andes.*

*Helix oblonga* MULL., Hist. Vermium ii, p. 86, and of BORN, GMELIN, DILLYWN.—*Bulimus oblongus* BRUG., Encycl. Méth. i, p. 318.—ORBIGNY, Voy. Am. Mérid. p. 297.—REEVE, C. Icon. f. 210. PFR., Monogr. ii, p. 21; iii, 304; iv, 366; vi, 10; Conchyl. Cab. pl. 22, f. 1, 2.—DROUET, Moll. Guyan. Fr. p. 58, pl. 2, f. 25, 26 (egg and young).—MART., Novit. Conch. v, p. 17; Conch. Mittheil. i, p. 157.—HEYNE-MANN, Malak. Bl. 1868, p. 107, pl. 5, f. 7 (jaw and teeth).—SEMPER, Reisen, p. 150, pl. 14, f. 10; pl. 16, f. 25; pl. 17, f. 1 (anatomy).—PARAVICINI, Boll. Mus. Zool. ed Anat. comp. Univ. Torino, ix, no. 181, p. 5.—*Turbo hæmastomus* GMEL., Syst. Nat. p. 3596.—*Bulimus hæmastomus* SCOPOLI Delic. Flor. et Faun. Insub. p. 67, pl. 25, f. 1, 2 (probably).—LEACH, Zool. Misc. i, pl. 29.—GUILD., Zool. Journ. ii, p. 440, suppl. pl. 16 bis, f. 1-4.—KUSTER, Conchyl. Cab. *Bul.*, p. 5, pl. 1, f. 3, 4.—TROSCHER, Archiv f. Naturg. 1849, i, p. 227, pl. 4, f. 1.—LESSON, Centurie Zoologique 1830, pl. 77.



*Bulimus roseus* MONTFORT, Conch. Syst. p. 259, pl. 65.—*Helix semi-lineata* MKE., Synops. (1), p. 75.—*Ampullaria rosea* SPIX, Test. Bras. p. 3, pl. 4, f. 3.

This is by far the most widely distributed of the *Borus* group, and is correspondingly abundant in collections. The largest specimen I have seen measures 132 mill. long (collection of Chas. W. Johnson). The smallest, from Mocambo, Brazil, collected by J. G. Anthony, measures 74 mill. long.

The spire is always conical, erect and elongated, the apex acute for a *Borus*. The distribution of this species north of Tobago I regard as probably effected by man.

Var. CRASSUS Albers. Pl. 15, fig. 20.

Shell very thick and heavy throughout; aperture smaller, shorter, the roseate lip much thickened by additions on its face; parietal callus rosy, thick, with a lump above.

Alt. 86, diam. 53, aperture alt. 43 mill.

*Parana region* (Orbigny, Gülich).

*B. oblongus* var. *crassa* ALB., Die Hel. 1850, pp. 142, 144.—MARTENS, Novit. Conch. v, p. 19.—*B. hæmastoma* SOWB., Conch. Illustr. f. 103, left side.—FERUSSAC, Hist. pl. 146, f. 3, 4.—*B. oblongus* var. ORB., Voy. dans l'Amér. Mérid. p. 298, pl. 37, f. 1 (living animal) etc.

The specimen figured on pl. 15 weighs  $3\frac{1}{2}$  oz.

Var. TOBAGOENSIS Pilsbry (n. v.). Pl. 14, fig. 70.

Like *oblongus* in size and general form, but pure white throughout under a deciduous yellow cuticle (rarely, if ever, entirely retained in the adult); the mouth porcelain-white or ivory-white; lip reflexed, thin or thickened; columella more distinctly folded than in the type. Alt. 89, diam. 52 mill.

*Island of Tobago.*

A considerable series of Tobago specimens is before me, collected by Dr. Benjamin Sharp and Thomas Bland, all albinos with well-developed columellar fold. All records of *oblongus* from that island refer to the white variety; and I, therefore, believe it to represent a constant insular subspecies. No specimens from other localities among the 50 or more which I have examined, are albinos. Von Martens states that he knew of no white-mouthed examples; so that it is moderately well established that such do not occur in continental South America, or if they do, are exceedingly rare.

*S. CAPILLACEUS* Pfeiffer. Pl. 14, fig. 69.

Shell oval or ovate, thin and light, closely and finely rib-striate on the earlier whorls, more irregularly wrinkle-striate on the body-whorl, at least above. Light brown under a thin brownish cuticle, which has a tendency to be deciduous in spiral bands. Suture more or less crenulated. Whorls 5-5½, the earlier 1 or 2 planorboid, forming a *very obtuse apex*; post-nepionic whorls 1½-1¾, the last whorl evenly convex. Aperture large, decidedly over half the shell's length, *brown within*; outer lip narrowly reflexed, pink, evenly curved; columella as in *oblongus*; parietal callus light, thin, transparent or pinkish.

Alt. 58, diam. 38; alt. apert. 35 mill.

Alt. 61, diam. 37; alt. apert. 35 mill.

*Banks of Upper Amazon (Solimoës) River (Yates); Miobamba, Brazil (Swift); Moyobamba, in the middle forest region of N.-E. Peru, 870 meters (Stübel).*

*B. capillaceus* PFR., P. Z. S., 1855, p. 93; Monogr. iv, p. 367; vi, 12.—HUPE, in Castelnau's Exped., p. 26, pl. 4, f. 3.—*B. oblongus* var. *capillaceus* MARTENS, Novit. Conch., v, p. 19; Conchol. Mittheil., i, p. 157.

This seems to me perfectly distinct from *S. oblongus* in the smaller size, fewer whorls, much more obtuse apex, etc., so far as I may judge from the 10 specimens I have seen.

Var. *SENERI* Jousseume. Pl. 30, fig. 23.

Shell umbilicated, solid, ovate, irregularly plicate-rugose and mal-leated, white, whorls 5, slightly convex, the last ventricose, about ¾ the shell's length; suture crenulated, aperture ovate oblong, dilated at base, milk-white inside; peristome thickened, narrowly expanded and reflexed, white with a slight rose tint, its ends joined by a spreading callus; right margin thicker, columellar much dilated. Alt. 70, width 37; aperture alt. 35, width 20 mill. (*Jouss.*).

*U. S. of Colombia (Jouss.).*

*Borus seneri* JOUSS., Bull. de la Soc. Zool. de France, 1884, p. 169, pl. 4, f. 3.

Differs from *Borus oblongus* in the smaller size, embryonic nucleus very large, thick shell, strong wide irregular riblets, forming projecting teeth at the suture; umbilicus large and deep; peristome white, slightly washed with rose; columellar margin very wide; plane of the aperture forming an angle of 20° with the axis.



It seems to differ from the variety following in the distinctly denticulate suture and large umbilicus; *S. capillaceus* var. *intertextus* having the suture non-denticulate and the umbilicus a mere chink. In the typical *S. capillaceus* there is usually a narrow chink only, but sometimes a distinct umbilical cavity. It is rather doubtful whether *seneri* and *intertextus* are true geographic races or only extreme specimens of an everywhere variable species.

Var. INTERTEXTUS Pilsbry (n. v.). Pl. 17, figs. 30, 31.

Shell with the size, blunt apex and sculpture of earlier whorls as in *capillaceus*, but heavier, last whorl with the wrinkle-striae anastomosing to form long, narrow diamond-shaped pits. Aperture rounder, the lip much thickened; parietal callus very heavy, and with the entire peristome of a bright rose-color; interior of mouth whitish. Alt. 64, diam. 41; apert. alt. 35 mill.

Corumbá, prov. Matto Grosso, Brazil (coll. C. W. Johnson).

Somewhat analogous to the var. *crassus* of *S. oblongus*.

*S. LICHTENSTEINI* Albers. Pl. 11, figs. 55, 56.

Upper whorls just as in *B. oblongus*; third whorl and those following uniform brown-yellow, the fold-striae gradually becoming more irregular, on the penultimate and last whorls broken into hammer-stroke like impressions in places; cuticle mostly well preserved; all whorls more swollen than in *B. oblongus*, especially the last, while the general form is more conical. The ante-penultimate whorl is more strongly convex, the penult. more flattened, and this gives the shell a peculiar aspect. Aperture broad-oval; peristome but little reflexed, and only very moderately thickened, *pure white*; columellar margin thin, forming a regular bow from basal to parietal margin, imperceptibly passing into the latter; parietal callus whitish, rather thin, with definite edge, and not very broad. (Mart.)

Alt. 73, diam. 46; apert. alt. 40, width 29, inside 22 mill.

Alt. 70, diam. 43; apert. alt. 41, width 31, inside 24 mill.

Upper Marañon River (Warszewicz); Guajango, Peru (Stoltzmann).

*B. lichtensteini* ALB., Malak. Bl., i, 1854, p. 216.—PFR., Novit. Conch., i, pl. 9, f. 1, 2; Monogr., iv, p. 336.—MARTENS, Novit. Conch. v, p. 20.—LUBOMIRSKI, P. Z. S., 1879, p. 721.

This species differs much from *S. oblongus* in the aperture. The cited figures (copied on pl. 11, figs. 55, 56) represent it broader and shorter above than any of the specimens before me. Young examples have a narrow umbilicus, and a small chink filled with earth remains to be seen in many adults. (*Martens*).

*S. ROSACEUS* King. Pl. 5, fig. 26; pl. 6, figs. 29, 30.

Shell oblong-ovate, rather thin, pinkish under a yellow cuticle, the spire flesh-pink; penultimate whorl more or less speckled or zigzagged with whitish. Whorls  $4\frac{1}{2}$ , the first planorboid, oblique to axis, with deep suture, smooth; the next whorl most minutely granular, with regularly crenulated suture; following whorls having irregular wrinkle-striae, and a dense, fine, but irregular decussate granulation, the sutures somewhat irregularly crenulated.

Aperture slightly over half the shell's length, ovate, fleshy-brownish within; peristome white, broadly reflexed, rather thin; outer lip evenly and well arched, columella concave below, oblique and with a weak straightish entering fold above, its outer edge broadly expanded, vaulted over the open (rarely closed) umbilicus; parietal callus light, transparent-whitish.

Alt. 52, diam. 28 mill.; aperture, alt. 29 mill.

Alt. 62, diam. 30 mill.; aperture, alt.  $32\frac{1}{2}$  mill.

*Chiloë* (Phil.) northward; *Huasco* (Bridges); *Valparaíso*; *Cochimbo*, *Chili*; *Huanuco*, *Peru* (Angrand); *Cocapata*, *Bolivia*.

*Bulinus rosaceus* KING, Zool. Journ., v, p. 341.—SOWB., Conch. Illustr., f. 5; Beechey's Voy. Blossom, pl. 58, f. 15; Conch. Man., f. 282.—*Bulimus rosaceus* DESH., in Lam. An. s. Vert., p. 269; in Fér. Hist., p. 36, pl. 139, f. 20–23.—POT. & MICH., Galerie, i, p. 153, pl. 15, f. 3, 4.—ORBIGNY, Voy. dans l'Amér., Mérid., p. 304, pl. 34, f. 11, 12 (living animal).—RVE., C. Icon., f. 87.—PFR., Monogr., ii, p. 52; Conchyl. Cab., pl. 68, f. 4, 5.—HIDALGO, Viaje al Pacif. p. 53.—Martens, Novit. Conch., v, p. 21.—MORELET, Sér. Conch. iii, p. 170.

*S. CRENULATUS* Pfeiffer. Pl. 13, figs. 65, 66, 67.

Shell oblong-ovate, rather thin, fleshy-buff, becoming flesh-colored above, usually more or less mottled with white in zigzag pattern throughout; the cuticle very thin, persistent. Whorls  $4\frac{1}{2}$ , the first planorboid, with deep, smooth suture; nepionic shell of nearly  $2\frac{1}{2}$  whorls, densely spirally striated, the second and all subsequent whorls with regularly, strongly crenulated sutures. Post-nepionic



whorls densely granulated throughout; last whorl flattened and descending in front. Aperture ovate, over half the shell's length; peristome white, broadly reflexed, the margins converging; outer lip well curved; columellar lip concave below, oblique and straightened above, broadly dilated over but not closing the umbilicus; parietal callus short, transparent-white.

Alt. 37, diam. 22 mill.; alt. of aperture  $22\frac{1}{2}$  mill.

Alt. 31, diam. 17 mill.; alt. of aperture 17 mill.

*Coquimbo, Huasco and Talcahuano, Chili* (Orb., Hidalgo),

*Bulinus chilensis* SOWB., P. Z. S., 1833, p. 36; Conch. Illustr., f. 4 (not *B. (Achatina) chilensis* Lesson, 1830).—*Bulimus crenulatus* PFR., Zeitschr. f. Mal., 1845, p. 46; Conchyl. Cab., p. 251, pl. 68, f. 8, 9; Monogr., ii, p. 53.—HIDALGO, Mol. Viaje al Pacif., p. 54.—MARTENS, Novit. Conch., v, p. 22.—*B. rosaceus* var. DESH., in An. s. Vert., viii, p. 269; in Fér. Hist., pl. 139, f. 22, 23.—ORB., Voy. dans l'Amér. Mérid. p. 304.—? *B. squamulatus* CRIST. & JAN., Villa, Disp. Syst., p. 36.

Inhabits the same region as *S. rosaceus*, from which the smaller size and more converging ends of peristome separate it.

This species varies a good deal in size and proportions of length to breadth; and the umbilicus, generally quite large, is occasionally wholly closed. The initial whorl is, when unworn, finely striated spirally as in the following species, from which the larger size, and more remote lip-ends easily separate *rosaceus*.

*S. CRENELLUS* Philippi. Pl. 15, figs. 21, 22.

Shell subimperforate, oblong-ovate, thin, obsoletely granulated; pale brown; spire obtuse; suture crenulated; whorls  $4\frac{1}{2}$ , convex, the last equalling five-ninths the total length, strongly descending. Aperture oblong; peristome expanded, subreflexed, moderately thickened, the margins separated; columella nearly perpendicular, violaceous.

Alt. 27, diam. 16 mill. (*Phil.*).

*Hacienda of Unigambal, Peru* (Raimondi).

*B. crenellus* PH., Malak. Bl. xiv, 1867, p. 67; Novit. Conch. iii, p. 346, pl. 81, f. 17, 18.—PFR., Monogr. vi, p. 24.

Nearly allied to *B. crenulatus* Pfr., but thinner, more elliptical, and much more weakly granulated; the mouth narrower, lip thinner and columella nearly vertical.

*S. PACHYCHILUS* Pfeiffer. Pl. 12, figs. 63, 64.

Shell ovate-oblong, whitish, rather solid; whorls 4-4½, the apical one planorboid; nepionic shell of 2½ whorls, spirally striated, some of the striæ beaded, distinctly crenulated at the suture; post-nepionic whorls 1½, *not regularly crenulated at suture*, wrinkle-striate, finely spirally granulated or with the granulation obsolete. Aperture ovate, white within; peristome isabelline, the ends approaching; outer lip slightly expanded and *very much thickened on its face*; columella regularly concave; umbilical chink narrow.

Alt. 35, diam. 20 mill.; alt. of aperture 20½ mill.

*Questa de Arenas, Huasco, Chili* (Bridges).

*Bulimus pachychilus* PFR., P. Z. S. 1842, p. 186; Symbolæ ii, p. 48; Monogr. ii, p. 46; Conchyl. Cab. p. 251, pl. 68, f. 6, 7.—PHIL. Abbild. u. Beschreib. i, p. 57, pl. 1, f. 14.—MARTENS, Novit. Conch. v, p. 22.

The thickened lip and obsolescence or irregularity of the crenulation of the suture on last whorl, distinguish this species from its nearest ally, *S. crenulatus*. The nepionic shell moreover, is not evenly spirally striate as in *crenulatus*, but has larger, granulated, spirals at intervals, with smooth finer ones between them. It inhabits a dry region, and is doubtless a modification of the *rosaceus* and *crenulatus* type.

*S. BRIDGESI* Pfeiffer. Pl. 2, figs. 4, 5, 6.

Shell slender, elongated-ovate, rather thin light brownish with usually a fleshy tint on the spire. Whorls 4½, the upper two forming a smoother but delicately spirally lirulate nepionic portion, first whorl sinking at the obtuse apex, sutures deep, smooth, becoming shallower on later whorls. Post-nepionic whorls 2½, densely but rather obsoletely decussate-granulate. Aperture ovate, over half the shell's length, oblique; *peristome flatly reflexed*, wide, whitish, thin, the ends converging, connected by a short but usually rather heavy, thin-edged whitish parietal callus; columella utterly foldless, dilated above, vaulted over the moderately large umbilicus.

Alt. 20½-22½, diam. 11½ mill.; aperture, alt. 12 mill.

*Province Huasco, Chili* (Bridges).

*B. bridgesi* PFR., P. Z. S. 1842, p. 186; Symbolæ ii, p. 43; Conchyl. Cab. pl. 68, f. 10, 11; Monogr. ii, p. 47.—PHIL., Abbild. u. Beschreib. i, p. 58, pl. 1. f. 15.



This is unquestionably a *Borus* of the *B. crenulatus* type, although the form is slender and the suture smooth. The large nepionic shell is distinctly demarked from the after-growth.

*S. LUTESCENS* King. Pl. 12, fig. 59; pl. 9, figs. 46, 47, 48.

Shell perforate, ovate, rather thin (or in a variety, thick and solid), covered with a thin pale yellow cuticle. Surface with inconspicuous growth-wrinkles and minutely decussate-granulate. Whorls  $4\frac{1}{2}$ , the first one planorboid, the last ventricose-oval; suture linear, impressed, descending and then ascending at aperture. Aperture ovate; outer lip narrowly expanded, thin or thickened, orange or brownish; columella expanded and vaulted over the perforation; parietal callus thin, transparent.

Alt.  $26\frac{1}{2}$ – $27\frac{1}{2}$ ; diam. 19–20 mill.; aperture, alt. 16– $16\frac{1}{2}$  mill.

*S. Uruguay*, at Montevideo (Paz, Martenez, et al.); Maldonado (King).

*Bulinus lutescens* KING, Zool. Journ. v, p. 340.—*Bulimus lutescens* PFR., Monogr. ii, p. 49; vii, 46.—MARTENS, Novit. Conch. v, p. 23, with var. *australis*.—*Bulinus nucleus* SOWB., Conch. Illustr. f. 33.—REEVE, Conch. Icon. f. 99.—DESH., in Fér. Hist. p. 37, pl. 139, f. 15, 16.—ORB., Voy. dans l'Amér. Mérid. p. 305.—STROBEL, Malac. Argent. p. 20.

Distinct from all the foregoing species (except *S. bridgesi*) in the non-crenulated sutures and absence of riblets or other special sculpture on the earlier whorls.

Var. *australis* Martens. Pl. 9, figs. 47, 48.

Similar to *lutescens*, but when adult rather heavier, the peristome much thickened as in *S. pachychilus*.

Alt.  $29\frac{1}{2}$ , diam. 20 mill.

*Bahia Blanca*, Prov. Buenos Ayres, Argentina (Orbigny; U. S. F. C. Str. 'Albatross').

The lip is somewhat thickened also in some of the specimens before me from Montevideo, though less so than in those from Bahia Blanca, which lies nearly 10 degrees further south. On the other hand, some of the specimens apparently quite adult, which I have seen from Bahia Blanca, have the lip thin; so that the variety is of but slight value.

S. GLOBOSUS Martens. Pl. 2, figs. 2, 3.

Shell imperforate, ovate-globose, solid, striatulate rather shining, roseate under a yellow cuticle. Whorls 5, convex, joined by a rather deep suture, the first and second smooth, forming an extremely obtuse apex, the last inflated, slightly descending at aperture. Aperture rather oblique, ovate; peristome white, thickened outside; outer lip strongly arched, columella also arched, somewhat calloused, appressed outwardly, above broadened on the parietal wall; parietal callus thin, wide. Length 42, diam. 31 mill.; aperture, length  $28\frac{1}{2}$ , width including peristome 25, or inside peristome 17 mill. (Mart.).

*Habitat unknown.*

*B. globosus* MARTENS in Pfr., Monogr. viii, p. 17; Novit. Conch. v, p. 24, pl. 140, f. 2, 3.

Of this peculiar species but one example from Dohrn's collection is before me. It reminds one of *B. lichtensteini* in form, but is comparatively shorter and rounder, the cuticle more shining, the deposit on the parietal wall wider, especially below, where it is prolonged over the umbilical tract. The first whorl is entirely flat, of the same height as the second, on which bare traces of vertical striæ begin to show; but on the third whorl these are somewhat more distinct, though remaining flat, never attaining the height and sharpness of those of *B. lichtensteini*. Finally, on the penultimate and last whorls they become closely crowded, flat, somewhat irregular wrinkle-striæ, which at the suture are somewhat more elevated. The suture is not deeply impressed, and falls only very moderately toward the aperture. (Martens).

Subgenus DRYPTUS Albers, 1860.

*Dryptus* ALB., Die Hel. 1860, p. 194, type *Bulimus moritzianus* Pfr.

Shell rather large, ovate or elongated, unicolored dark brown or zebra-striped, the surface comparatively smooth, not roughly malleated or much wrinkled. Aperture ovate; peristome varying from slightly expanded to reflexed and recurved. Columella slightly convex above or with a stout fold. Type *S. moritzianus* Pfr.

This group contains a few large species of Venezuela and Colombia, not having the wrinkle-sculpture of *Plekocheilus*, the spiral lines of *Coniclus* or the granulation of *Eurytus*. While a natural group, it



is not easily defined to exclude some species of other sections. The apex is often decollate, in living examples.

*Key to species.*

- a. Columellar fold weak, tinted; spire not more striate than body-whorl.
  - b. Surface with faint spiral cords; spire nor pitted; outer lip narrow.
    - c. Aperture over half the alt.; fold weak; microscopically lineolate vertically, *moritzianus*; *guerinii*.
    - cc. Aperture half the alt. or less; fold stronger; zebra-striped, *pardalis*.
  - bb. Surface wrinkle-striate and granulated; unicolored; ovate, *stübeli*.
  - bbb. Surface of spire pitted; shell long; lip heavy, wide, brown, *funcki*.
- aa. Columellar fold strong, white; no spiral cords; spire rib-striate.
  - b. Surface microscopically w-punctate or granulate, *marmoratus*.
  - bb. Surface microscopically irregularly granulate, *venezuelensis*.

S. MORITZIANUS Pfeiffer. Pl. 21, figs. 46, 47.

Shell oblong-ovate, solid and strong, *imperforate*; chestnut-brown, with darker streaks; surface of latter two whorls *closely and somewhat spirally malleated*, the malleation especially on the back of last whorl; with slight growth-wrinkles below suture. *Micro-sculpture*, an *excessively fine, dense, longitudinal, vermiculate striolation*, hardly visible except on last whorl, the next-to-last whorl with the striolation more confused, but *not* regularly granulate. Whorls remaining  $5\frac{1}{2}$ , the apex being lost by erosion or truncation, and plugged. Earlier whorls generally with more or less zigzag, Achatina-like marking.

Aperture decidedly over half the shell's length, dark bluish inside; *peristome buff*, expanded, *thick*; columella buff, spreading above, with a distinct entering fold. Parietal callus rather thin, transparent-whitish.

Alt. 90, diam. 42, alt. aperture 47 mill.

Alt. 91, diam. 48, alt. aperture 52 mill.

Alt. 81, diam. 45, alt. aperture 46 mill.

Alt. 60, diam. 33, alt. aperture 35 mill.

Alt. 54, diam. 30, alt. aperture 33 mill.

Caracas, and Province Truxillo, Venezuela; Pamplona U. S. of Colombia; Punamarca, Peru.

*Bulimus moritzianus* PFR., Zeitschr. f. Malak. 1847, p. 66; Conchyl. Cab. p. 254, pl. 69, f. 2-5; Monogr. ii, p. 23.—REEVE, C. Icon. pl. 25, f. 162.—DESH. in Fér., Hist. ii, p. 26, pl. 144, f. 7-10.—MARTENS, Binnenmoll. Venez. p. 16.—Lubomirski P. Z. S. 1879, p. 721.

The columellar fold is not so strong as in *S. marmoratus*; the spire is shorter than in *S. pardalis*; and it differs from both of these, as well as from the other allied species, in the minute sculpture, which is seen only with a strong lens. In the series of 10 specimens before me, the apex is constantly decollated. Seen from behind, the lowest suture is noticeably oblique to those above.

Var. *wilsoni* Pilsbry. Pl. 21, fig. 48.

Shell with sculpture and general form of *moritzianus*, but the lip very narrowly expanded, liver-brown; columella broadly arcuate below, with scarcely perceptible fold above. Yellow, closely zigzag-streaked with brown, spire purple above.

Alt. 69, diam. 40 mill.; aperture alt. 39 mill.

S. GUERINI Pfeiffer. Pl. 3, fig. 7.

Shell imperforate, oblong-ovate, rather thin, irregularly rugose-striate; tawny-brown; spire conic, obtuse, paler, ornamented with streaks and spots of red. Whorls 5, a little convex, the last a little longer than the spire; columella buff, arcuate, somewhat twisted above. Aperture acute-oval, leaden and very shiny inside; peristome narrowly reflexed, buff, the basal lip forming an indistinct angle with the columella. Alt. 41, diam. 18½ mill.; aperture, 23 mill. long, 13 wide in the middle. (*Pfr.*).

*U. S. of Colombia* (Cuming coll.).

*B. guerini* PFR., P. Z. S. 1846, p. 40; Monogr. ii, p. 27.—DESH., in Fér. Hist. p. 52, pl. 130, f. 3, 4.

I am disposed to believe with Reeve, that this is a small form of *S. moritzianus*.

S. PARDALIS Férussac. Pl. 19, fig. 36.

Shell elongated-ovate, rather slender, solid, *perforate* or rarely closed; *zebra-striped irregularly with purple-brown and white under a thin yellow cuticle*. Surface with numerous low, inconspicuous rather close spiral cords, malleated between them; without minute sculpture, or with traces of longitudinal striolation in places. Spire



elongated; apex obtuse, the tip *turning inward*, generally entire; earlier whorls densely granulated when not eroded. Whorls 6.

Aperture slightly less than half the shell's length, narrow-ovate, bluish inside; peristome white or yellowish, narrowly expanded, rather thick; columella short, vertical, with a short but *strongly convex entering fold* above, parietal callus bluish-transparent.

Alt. 85, diam. 44, alt. of aperture 43 mill.

Alt. 88, diam. 42, alt. of aperture 43 mill.

Alt. 70, diam.  $37\frac{1}{2}$ , alt. of aperture 38 mill.

*Maricaoibo and Prov. Cumana, Venezuela* (Swift); *La Baja, prov. Pamplona, U. S. of Columbia* (Funck, for *B. leptochilus*).

*Helix* (*Cochlostyla*) *pardalis* FER., Prodrôme p. 48. Hist. pl. 112, f. 7, 8 (immature).—*Bulimus pardalis* PFR., Symb. iii, p. 86; Conchyl. Cab. p. 184, pl. 54, f. 1-5; Monogr. ii, p. 36.—MARTENS, Binnenmoll. Venez. p. 16. Not *B. pardalis* Reeve.—*B. leptochilus* PFR., P. Z. S. 1848, p. 111; Monogr. ii, p. 534 (young shell).—*B. lindeni* REEVE, Conch. Icon. pl. 31, f. 189.—*B. astrapoides* JONAS, Zeitschr. f. Malak. 1844, p. 35; Molluskologische Beiträge, pl. xi, f. 17, 17a.—PHILIPPI, Abbild. u. Beschreib. i, p. 157, pl. 2, f. 3, 4.

Allied to *S. moritzianus*, but zebra-striped throughout like an *Achatina*, and with only faint traces of the microscopic sculpture. The columellar fold is decidedly stronger than in *moritzianus*, but less strong than *S. marmoratus*. The aperture is as a general rule less than half the shell's length; but in one specimen of the ten before me it slightly exceeds the half. The last suture, viewed from the back, is nearly parallel with those above in *S. pardalis*, but is notably oblique in the other species mentioned.

S. MARMORATUS Dunker. Pl. 20, fig. 45.

Shell oblong-ovate, solid, perforated; covered with a yellow or brownish cuticle, under which it is *zigzagly zebra-striped* purple-brown and whitish, the earlier whorls dull purplish-brown with light suture. Surface with *no malleation or spiral cords*, but usually showing some spiral girdles of short, close, vertical wrinkles, that at suture most constant. Some whorls of spire with separated rib-striae. Whorls  $5\frac{1}{2}$ , the last, especially its latter portion, *most minutely, densely punctate-engraved in zigzag or  $\approx$  pattern*, the design usually much interrupted, but always recognizable; next-to-last whorl more coarsely, densely granose, without pattern.

Aperture somewhat over half the shell's length, ovate, livid-bluish within; peristome white or fleshy-yellow edged, well expanded and reflexed, moderately thick, columella with a *very strong, obliquely entering fold* above.

Alt. 96, diam. 53, alt. of aperture 53 mill.

Alt. 88, diam. 51, alt. of aperture 50 mill.

Alt. 108, diam. 50, alt. of aperture 56 mill. (*Pfr.*).

*Caracas, Venezuela.*

*B. marmoratus* DKR. in Phil., Abbild. u. Beschreib. i, p. 157, pl. 2, f. 1, 2 (October, 1844).—PFR., Monogr. iv, p. 381.—MARTENS, Binnenmoll. Venez., p. 15.—*B. pardalis* var. PFR., Monogr. ii, p. 36; iii, p. 317.—*B. pardalis* REEVE, Conch. Icon. pl. 24, f. 157.

This species differs from *S. venezuelensis* only in the more or less distinctly criss-cross pattern of the microscopic sculpture on the last whorl, but so characteristic is this that I do not feel justified in uniting the two species. The striping is sometimes very irregular and zigzag, sometimes merely streaked; and the size of the shell varies considerably.

*S. VENEZUELENSIS* Nyst. Pl. 23, figs. 59, 60.

Shell oblong-ovate, solid, perforated; *rich chestnut brown*, with zebra-striping of yellow on next to the last whorl and the upper part of last whorl, the earlier whorls dull reddish or purplish-brown with a whitish sutural border. Surface with no malleation or spiral cords, but showing some *spiral zones or lines of short, close vertical wrinkles*, one always below suture. Some whorls of spire rib-striate. Whorls  $5\frac{1}{2}$ . Surface showing under a lens, *a minute, dense granulation, the granules crowded, not in the least arranged in any pattern.*

Aperture a little exceeding half the shell's length, ovate, livid-bluish within; peristome broadly reflexed, white or yellowish, moderately thick; columella with a *very strong, obliquely entering fold* above; parietal callus rather thin and transparent.

Alt. 85, diam. 46, alt. of aperture 45 mill.

Alt. 89, diam. 50, alt. of aperture 48 mill.

Alt. 83, diam. 49, alt. of aperture 45 mill.

Alt. 88, diam. 46, alt. of aperture 48 mill.

*Cavern of Guacharos, Prov. Cumana (Funck); Puerto Cabello and Caracas (Swift), Venezuela.*



*Bulimus venezuelensis* NYST, Bull. de l'Acad. Roy. de Bruxelles, xii, (1), p. 227, pl., figs. 1a, 1b. (" *B. venetiolensis* " on plate), 1845.

This species has been considered a synonym of *marmoratus* by various authors, but having a good series of both species before me I have satisfied myself that they are distinct. The microscopic granulation of the surface is wholly irregular in this species, while in *marmoratus* it shows more or less obvious arrangement into a zigzag pattern. In the form, coarser sculpture, strong columellar fold, etc., the two species are practically identical.

The body-whorl is often almost free from *Achatina*-like striping, and though usually of a rich reddish chestnut color, this is occasionally replaced by a peculiarly pleasing olive-green.

S. STUBELI Martens. Pl. 20, figs. 42, 43, 44.

Shell perforate, ovate-oblong, closely subgranulose, rugose-striate; pale chestnut, unicolored. Spire subconoid, apex worn; whorls 4-5, but little convex, the upper smooth, the last slightly more ventricose.

Aperture slightly over half the shell's length, subovate, livid inside; peristome thickened, narrowly reflexed, pale orange; the ends joined by a shining callus; outer margin lightly arcuate, columellar margin rather widened, free, passing inward in a moderately distinct fold. Alt. 60, diam. 32; aperture, alt. 34, width 24 including peristome; measured inside, 29 x 18½ mill. (*Martens*).

*Fusagasugá*, New Granada, about 1700 meters alt. (*Stübel*).

*Bulimus (Dryptus) stübeli* Mts., Conch. Mittheil. ii, p. 172, pl. 32, f. 6, 7, 8.

The striae are coarse, somewhat oblique and wrinkle-like, and more or less distinctly, finely granulated, especially on the last whorl. It is uniform yellowish-brown. The apex is lost in the unique type, so that the number of whorls is not known exactly, but there must be at least 4, and apparently a half or whole whorl more. The upper one preserved is smooth, and evidently this is not entirely on account of erosion; there is none of the special sculpture visible on it, such as is so characteristic of most *Borus* species. There are 2 or 3 granules in the distance across each wrinkle (see fig. 43).

S. FUNCKI Nyst. Pl. 18, figs. 34, 35.

Shell oblong, solid, umbilicate or perforate; uniform dark chestnut-brown or olive-brown, the spire reddish and often with some

light zigzag streaks; apex purplish. Surface of body-whorl shining, with indistinct, irregular growth-marks, often some low, hardly noticeable spiral cords, and under a strong lens seen to be finely and densely, but obsoletely granulated. *Whorls of the spire peculiarly pitted throughout, and shortly plicate or puckered below the sutures.* Whorls about  $5\frac{1}{2}$ , the apex obtuse, generally entire; suture generally edged by a white line.

Aperture half the shell's length or less, dark brownish inside; *peristome brown, very broadly reflexed and recurved*, moderately thick and rounded on the face. Columella deeply entering, nearly straight above; parietal callus transparent.

Alt. 80, diam. 38, alt. of aperture 40 mill.

Alt. 82, diam. 41, alt. of aperture 42 mill.

Alt. 89, diam. 38, alt. of aperture 40 mill.

*Mts. of Caripe, near the cavern of Guacharos, prov. Cumana, Venezuela (Funck).*

*Bulimus funckii* NYST. Mém. Soc. Roy. Sci. Liège, i, (1843), p. 262, pl. 7, f. 2; Bull. de l' Acad. Roy. Brux. xii, (2), p. 146, pl. 1, f. 1 (1845).—PHIL., Abbild. ii, p. 9, pl. 3, f. 1.—REEVE, C. Icon. pl. 28, f. 171.—DESH. in Fér. Hist. p. 51. pl. 138, f. 13, 14.—PFR., Monogr. ii, p. 36; vi, 24; Conchyl. Cab. p. 185, pl. 55, f. 1-4.—*B. superbus* JONAS, Zeitschr. f. Malak. 1844, p. 35; Molluskologische Beiträge, p. 24, pl. 11, f. 16.—*B. adoptus* REEVE, C. Icon. pl. 82, f. 608.

The narrow form, heavy lip and shallow pit sculpture of the early whorls are characteristic. Reeve has called a light-lipped form *B. adoptus*. It may perhaps prove varietally distinguishable (fig. 35).

#### Subgenus THAUMASTUS Albers, 1860.

*Thaumatus* ALBERS, ms. in Die Hel. edit. Martens, p. 215, type *Bulimus hartwegi* Pfr.—*Orphnus* ALBERS, Die Hel. 1850, p. 146.—MART., in Die Hel. 1860, p. 193, type *Bulimus taunaysii* Fér. Not *Orphnus* Macleay, 1819 (Coleoptera), nor *Orphnus* Lef. 1842 (Neuroptera). *Tatutor* JOUSSEAUME Le Naturaliste ix, 1887, p. 6, type *T. tatutor* Jous.

Shell long-ovate, with *lengthened spire* and blunt apex; moderately solid, opaque, usually streaked or banded; aperture small, less than half the shell's length, ovate, *the outer lip blunt, not expanded*; columella short, reflexed, with a rather weak fold or none. Type *S. hartwegi* Pfr.



This group differs from the preceding subgenera in its simple, unexpanded lip. A few forms of *Dryptus*, such as *S. pardalis*, connect to some extent, the two groups. *Thaumastus* is most abundantly developed on the eastern slope of the Andes in Peru, while *Dryptus* is mainly a group of Venezuela and Columbia, *Strophocheilus* of Brazil, and *Borus* covers practically the entire range of all the other groups.

It is a mere accident that the name *Thaumastus* is applied to this group, the fact being that of the entire list given in *Die Heliceen*, only one species—the one designated as *type*—belongs to the present genus, the others being *Bulimulidæ*. *Thaumastus* as here used is therefore by no means equivalent to *Thaumastus* of former authors. It is more nearly equal to *Orphnus* (a preoccupied name), but includes, as will be seen, some species referred hitherto to *Scutalus*, etc.

The species fall into four groups distinguished by the following characters :

*a.* Shell distinctly perforate or umbilicated.

*b.* Large (alt. about 80 mill), solid, with dark lip and columella, the body-whorl with some spiral series of grains,

*Group of S. melanocheilus.*

*bb.* Usually smaller, without this special sculpture,

*Group of S. inca.*

*aa.* Shell imperforate.

*b.* Nepionic whorls longitudinally rib-striate,

*Group of S. taunaisii.*

*bb.* Nepionic whorls thimble-pitted, *Group of S. thompsoni.*

As the apical sculpture of a considerable number of species is unknown, some transpositions and other changes in this grouping will probably be necessary. Moreover, many cabinet specimens are too worn to show the true sculpture.

#### *Group of S. melanocheilus.*

Perforate, with dark peristome and columella, the surface with some spaced spiral series of granules; nepionic shell closely waved-striate.

*S. MELANOCHILUS* Nyst. Pl. 23, figs. 62, 63.

Shell *perforate*, lengthened-ovate, solid; chestnut brown, with a darker girdle below the white-edged suture, bounded below by a

yellowish band, the periphery encircled by a dark girdle between two yellowish bands. Surface somewhat shining, irregularly wrinkled by growth-striæ, and having *some spaced spiral series of granules on the upper of the body-whorl*, more or less distinct on earlier whorls; the nepionic shell minutely and closely vermiculate-striate. Spire lengthened, regular, having a moderately impressed suture margined below by a *puckered or crenulate border*; whorls a trifle over 6, the first forming a planorboid obtuse apex, the rest gently convex; latter half of last whorl obliquely descending.

Aperture ovate, whitish-brown and lustrous within; *peristome slightly expanded, with a wide thickened black-brown rim within*; columellar margin dark brown, reflexed, widened above *vaulted over the large, open perforation*, with an oblique, feebly convex, long entering fold. Parietal wall covered with a rather thick dark callus. Alt. 80, diam. 38–40 mill.; alt. of mouth 40 mill.

"*Pampas of South America*" (Nyst.); *Andes of Peru* (Swift); *Puraguay* (Reeve).

*Bulimus melanocheilus* NYST, Bull. de l'Acad. Roy. de Sci. et Belles-Lettres de Bruxelles, xii, pt. 2, p. 149, pl. 2, f. 3a, 3b.—PFR., Monogr. ii, p. 141.—REEVE, Conch. Icon. pl. 28, f. 172.—*B. melanocheilus* Auct.

Differs from other species of the group in its open umbilicus, dark peristome, etc. Fig. 62 is a copy of that of Nyst. Fig. 63 represents one of the specimens before me, showing the bands much more distinctly. No exact localities for the species seem to be recorded.

S. SANGOÆ Tschudi. Pl. 24, figs. 64, 65.

Shell perforate, conic-turritid, the last whorl rapidly increasing, convex. Upper whorls striolate, lower striated, the body-whorl subcancellated and somewhat beaded. Reddish-brown with a reddish-yellow band following the sutures, continuing on the body-whorl. [There are two bands: one subsutural, the other at periphery; the latter being covered on whorls of spire].

Aperture acutely ovate, scarlet-reddish; peristome simple, acute, blackish, the columellar margin shorter, impressed, dilated.

Alt. 81, diam. 40 mill.; whorls 6. (*Tschudi*).

*Sangoa, Peru*, in primæval forest (*Tschudi*); *Amable Maria* (*Jelski*).

*Bulimus sangoæ* TSCHUDI, in Troschel, Archiv für Naturg. xviii, 1852, p. 189, pl. 6, f. 1.—PFR., Monogr. iii, p. 317. LUBOMIRSKI, P. Z. S. 1879, p. 721.



Very nearly allied to *S. melanocheilus*, but in this species the spiral series of beads seem much more strongly developed.

*Group of S. taunaisii.*

Imperforate; the nepionic shell sculptured with fine vertical more or less waved riblets or striæ.

*S. FOVEOLATUS* Reeve. Pl. 24, figs. 71, 72, 73.

Shell hardly perforate, oblong-ovate, rather solid, somewhat shining, longitudinally striatulate or obsoletely plicatulate, transversely sculptured with inconspicuous close impressed-punctate lines. Chestnut-brown, with a narrow whitish band below the suture; covered with a very thin corneous epidermis, sometimes having transverse irregular and flexuous whitish lines (fig. 73). Spire conoid, exserted, the apex somewhat obtuse; suture plicate, slightly crenulate, and around the last whorl it is white. Whorls 6, slightly convex, the earlier foveolate below the sutures, under a lens seen to be minutely costulate-striate. Last whorl obliquely descending. Columella suboblique.

Aperture ovate-acuminate, violaceous inside, somewhat pearly, fourth-ninths to one-half the shell's length; peristome slightly reflexed, somewhat thickened, white; its ends joined by a very thin callus; right margin regularly arcuate; columellar margin dilated and reflexed above, nearly closing the perforation.

Alt. 68, diam. 33 mill. (*Hidalgo*).

*Peru*; *Vitoe*, near *Sarma* [Tarma?], (*Rve.*), *Amable Maria* (*Jelski*), and *Chanchamayo* (*Isern*); *Chili* (*Philippi*).

*Bulimus foveolatus* REEVE, P. Z. S. 1849, p. 97; Conchol. Icon. pl. 73, f. 526 (July, 1849).—HIDALGO, Mol. Viaje al Pacif. p. 56, pl. 6, f. 4, 5.—PFR., Monogr. iii, p. 305; iv, p. 368; vi, 12; viii, p. 16.—*Bulimus mahogani* PFR., Symb. i, p. 42; Monogr. ii, p. 24; Conchyl. Cab. p. 40, pl. 13, f. 1, 2. Not *B. mahogani* Sowb., Conch. Illustr. f. 59.—*B. impressus* TSCHUDI ms., teste Troschel, Archiv f. Naturg. 1852, i, p. 188.

A shorter, more compact species than *melanocheilus* or *taunaisii*.

*S. MAGNIFICUS* Grateloup. Pl. 25, figs. 74, 75.

Shell imperforate, lengthened oblong, solid, *glossy*. Dark olive-brown, with darker oblique streaks, yellow-bordered sutures, and a narrow peripheral light girdle, sometimes hardly visible; the spire

dull reddish-brown above. *Surface shining*, smooth on the body-whorl except for slight growth-wrinkles and some traces of oblique short sulci, often imperceptible; the spire very indistinctly decussated; nepionic shell granulated by the breaking up of vermiculate fine rib-striæ, sometimes appearing somewhat thimble-pitted. Spire convex-conic, the apex obtuse, entire or nearly so. Whorls nearly 7, slightly convex, the last obliquely descending a little.

Aperture narrow, ovate-acuminate, dark, with a pearly luster within; peristome white, thin, obtuse, not expanded nor perceptibly thickened within. Columella white, having an oblique, twisted entering fold above. Parietal callus pearly-translucent.

Alt. 78, diam. 34; alt. of aperture 35 mill. Sometimes stouter.

*Brazil; Peru (?)*

*Bulimus magnificus* GRAT., Actes Soc. Linn. Bordeaux, xi, 1839, p. 165, 419, pl. 4, f. 1.—DESH. in Fér., Hist. ii, p. 31, pl. 142A, f. 15, 16.—PFR., Monogr. ii, p. 165; Conchyl. Cab. p. 219, pl. 61, f. 1, 2.—*Bulimus taunaysii* REEVE, Conch. Icon. pl. 33, f. 202.

Typical examples are darker and more glossy than *S. taunaisii*, smoother, often with no sutural margination, whatever; the lip thinner, and interior of the aperture very dark. There are, however, some more or less intermediate forms. It is likely that the undescribed *Bulimus monozonalis* Desh. is a small specimen or variety of this species.

A stouter form occurs, lighter in color and with proportionately larger aperture. Alt. 62½, diam. 32; alt. of aperture 30 mill. This is near *taunaisii* in color, but still the suture is not margined and the sculpture of nepionic shell and body-whorl is as described above for *magnificus*.

Var. MONOZONALIS Deshayes. Pl. 25, figs. 76, 77.

This form was figured on pl. 144, figs. 2, 3 of Férussac's Histoire, and given the above name in the explanation of plates of that work, by Deshayes. It may not improbably be the undescribed *Helix pullata* of the Prodromus, p. 48. The figures represent a shell much like typical *S. magnificus* in color, etc., but smaller.

Alt. 51½, diam. 24 mill.

S. TATUTOR Jousseaume. Pl. 30, fig. 24.

Shell subperforate, ovate-oblong, striated, brownish-tawny; whorls 6½ or 7, slightly convex, the last with an ill-defined whitish band in



the middle, invisible when the cuticle is intact, longer than the spire; suture whitish margined, crenate. Aperture oval, whitish, shining inside; columella white, somewhat twisted; outer lip thickened, subreflexed, black-edged; parietal callus black. Alt. 100, diam. 50; aperture, alt. 55, width 30 mill. (*Jouss.*).

*New Granada.*

*Tatutor tatutor* JOUSS., *Le Naturaliste*, IX, p. 6, f. 1 (March, 1887).

Larger than *S. melanocheilus*, with larger, more spreading aperture, stronger striation, thicker epidermis and lacking the brown band between two light ones of that species. It is probably most nearly allied to *S. taunaisii*, but seems proportionally wider. M. Jousseau displays his accustomed ingenuity in the generic and specific combination he has chosen.

*S. TAUNAISII* Férussac. Pl. 25, figs. 78, 79.

Shell imperforate, lengthened-ovate, solid. *Yellowish-chestnut, with few or many irregularly placed dark chestnut oblique streaks; the spire dull reddish-brown; sutures more or less distinctly light-margined throughout. Surface with irregular wrinkles of growth and numerous unequally but wide spaced spiral incised lines, cutting the growth-wrinkles, and often becoming more or less obsolete on the body-whorl, absent below; spire indistinctly decussated; nepionic whorls sculptured with fine, close and regular slightly waved rib-triæ, but usually in large part eroded or worn in adults. Spire conic, the apex obtuse, generally truncated and plugged. Whorls almost 7, nearly flat, the suture linear, but around last whorl it becomes more impressed, and has a distinct crenulated margin defined by a groove.*

Aperture less than half the shell's length, small, narrowly ovate, white inside; peristome white, thickened within, blunt, not expanded; columella white, with a twisted, convex entering fold, broadly reflexed in a closely appressed callus over the umbilical region; parietal callus white or transparent.

Alt. 84, diam. 36, alt. of aperture 37 mill.

*Brazil; Corcobado, Rio Janeiro and Macahé (Paz and Martinez); Tijuca (A. D. Brown).*

*Helix (Cochlostyla) taunaisii* FER., *Prodrom*. p. 48; *Hist.* pl. 113, f. 4-6.—RANG, *Ann. Sc. Nat.* xxiv, p. 18.—*Bulimus taunaisii* GRAY, *Ann. of Philos.* (n. ser.) ix, p. 414.—BECK, *Index*, p. 52.—DESH. in

Fér., Hist. ii, p. 32.—PFR., Monogr. ii, p. 141; Conchyl. Cab. p. 220, pl. 61, f. 3, 4.—HIDALGO, Viaje al Pacifico p. 66.—*B. taunaysii* ORB., Voy. dans l'Amér. Mérid. p. 294.—?? *Helix* (*Cochlostyla*) *pullata* FER., Tabl. Syst., p. 48 (no description).

This species is very closely allied to *S. magnificus* but it is lighter colored, more roughly sculptured, the sutural margination is constant, and the peripheral light girdle, distinct in the young, is generally not visible in adult shells. Still, I doubt whether they can ultimately be held distinct species.

*S. ASCENDENS* Pfeiffer. Pl. 25, fig. 80.

Shell imperforate, ovate-oblong, solid; irregularly striated and obsoletely decussated with spiral impressed lines; but little shining; tawny, with a few chestnut streaks. Spire lengthened, convex, the apex obtuse; suture simple. Whorls 7 to 8, the earlier flat, following a little convex, the last three-sevenths the shell's length, rounded, somewhat ascending in front. Columella white, subvertical, lightly folded above. Aperture vertical, narrow, subelliptical, whitish inside; peristome slightly thickened, straight. Alt. 95, diam. 34; aperture, alt. 41, width in the middle inside 18 mill. (*Pfr.*).

Brazil (Cuming Coll.).

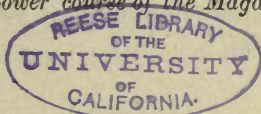
*Bulimus ascendens* PFR., P. Z. S., 1852, p. 136; Monogr. iii, 378; Conchyl. Cab., p. 247, pl. 66, f. 7.

I have not seen this species, which seems to differ from *S. taunaisii* mainly in its more lengthened form and the different form of the columella. Like *S. taunaisii*, it seems to lose the apical whorls.

*S. PLUMBEUS* Pfeiffer. *Unfigured.*

Shell imperforate, oblong, solid, malleated with oblique impressions, streaked and flammulate with reddish under an olivaceous cuticle. Spire convex-conic, apex blackish, rather obtuse; suture subcrenulated. Whorls 6, scarcely convex, the last a little shorter than the spire, somewhat ascending in front, the base attenuated; columella lightly folded, bluish-white. Aperture scarcely oblique, semioval, livid-black inside, with a pearly luster. Peristome blackish-leadene, thickened and narrowly reflexed. Alt. 93, diam. 36 mill.; aperture, inside, 43 mill. long, 16 wide (*Pfr.*).

Venezuela (Mus. Cuming); *Lower course of the Magdalena River* (Wallis).





*B. plumbeus* PFR., P. Z. S., 1855, p. 114; Monogr. iv, p. 369; vi, p. 13.—MOUSS., Malak. Bl., xvi, 1869, p. 173.

*S. HECTOR* Pfeiffer. *Unfigured.*

Shell subimperforate, elongate-ovate, rather solid, tawny-white under a deciduous cuticle; spire conic, the apex rounded; whorls 6, slightly convex, the earlier closely hair-striate, the last scarcely exceeding the spire in length, plicate-striate and obsoletely decussated. Columella slightly arcuate, not folded. Aperture subvertical, acuminate-oval, white inside, shining; peristome white, margins joined by a white callus, the right margin somewhat thickened, very narrowly expanded; columellar margin dilated above, adnate. Length 71, diam. 35 mill.; aperture, length 36, width  $19\frac{1}{2}$  mill. (*Pfr.*).

*Brazil* (Miers, in Cuming Coll.).

*Bulimus hector* PFR, Malak. Bl., iv, 1857, p. 157; Monogr., iv, p. 367; vi, p. 11

Has been considered a *Borus* of the *B. oblongus* group, on account of the color and the sculpture of earlier whorls, but is evidently much slenderer than any of that group.

*S. LARGILLIERTI* Philippi. Pl. 26, figs. 89, 90.

Shell elongate-oblong, the apex obtuse, *rather thin*, tawny, painted with irregular chestnut streaks. Whorls  $6\frac{1}{2}$ , a little convex, under a lens seen to be obsoletely transversely striated; the last whorl two-fifths the total length; suture hardly marginated, slightly crenulated. Aperture oblong-ovate; columella white, somewhat twisted; lip white, simple. Alt. 53 diam. 21 mill. (*Phil.*).

*Santa Catarina, Brazil* (Largilliert).

*Bulimus largillierti* PHIL., Abbild. ii, p. 11, pl. 3, f. 6, (1847).—DESH. in Fér., Hist. p. 33, pl. 144, f. 5, 6.—PFR., Monogr., ii, p. 166. *B. consimilis* REEVE, Conch. Icon., pl. 53, f. 346 (Nov., 1848).

The present *Bulimus* shows great agreement in structure with *B. taunaisii* of which I have a variety with exactly the same coloring; but it is far smaller, conspicuously thinner-shelled, the last whorl narrower, the contour more cylindrical, less conical, the white fold of the columella less projecting, and the sutures of the last whorl are not marginated—differences justifying the separation from *B. taunaisii* (*Phil.*).

I have given Philippi's words above, and on pl. 26, f. 90, a copy of his figure. Reeve's *B. consimilis* (pl. 26, fig. 89) is absolutely synonymous. See under next species for comparisons.

*S. ACHILLES* Pfeiffer. Pl. 26, figs. 84-88.

Shell imperforate, ovate-elongated, rather solid; tawny brownish, more or less profusely obliquely *streaked with dark brown and white* (the streaks spreading at suture), under a thin yellow cuticle, and showing a *more or less distinct light girdle at the periphery*. Surface inconspicuously wrinkle-striate, *decussated by incised spiral lines*, rather obsolete on last whorl; the *nepionic shell densely and finely rib-striate*, the striæ rather wavy. Spire produced, conic, the *apex very obtuse*, entire. Whorls  $6\frac{1}{2}$ , first planorboid, several following hardly convex, the latter two whorls gently convex with more impressed suture, which is slightly marginated or not, and generally ascends somewhat in front.

Aperture small, narrowly ovate, fleshy inside; peristome white, simple, obtuse, slightly thickened inside; columella deeply indented, having a slightly convex, entering fold above.

Alt. 57, diam.  $25\frac{1}{2}$ ; alt. of aperture 26 mill.

"*Banks of the Amazon*" (Mus. Cuming); *Piracicaba, on an upper affluent of the Tiete, tributary of the Parana River, Prov. S. Paulo, Brazil* (Nehring).

*Bulimus achilles* PFR., P. Z. S., 1852, p. 137; Conchyl. Cat., p. 247, pl. 66, f. 9; Monogr., iii, 378.—MARTENS, Conchol. Mittheil., iii, Dec., 1889, p. 11, pl. 40, f. 8.—*B. achilles* var. *Nehringi* MARTENS, t. c., p. 12, pl. 40, f. 9, 10.

I am disposed to consider this merely a stouter form of *S. largillierti* Phil.; but having no typical examples of that species before me, it may be best, until the identity is proven, to let *achilles* stand as a species. The locality given, "*Banks of the Amazon*," rests upon the insecure basis of a Cumingian label.

Var. *nehringi* Martens. Pl. 26, figs. 87, 88.

Ground-color lighter; peripheral light band distinct. This form has probably no varietal status. It is from Piracicaba, Prov. S. Paulo. It will be noted that *S. largillierti*, which is very nearly allied, if not identical, is from the adjacent province, Sta. Catarina.

*S. achilles* is at all times a smoother shell than *S. porphyrius*, has a different pattern of sculpture on the apical whorls, and is not umbilicate, although occasional specimens show a very slight chink.



S. HARTWEGI Pfeiffer. Pl. 26, figs. 81, 82, 83.

Shell imperforate, lengthened-ovate, solid; fleshy-brown, with darker and whitish streaks and dots. Surface with slight wrinkle-striæ of growth, slightly puckered at sutures, the nepionic shell corneous, with fine, close, waved rib-striæ. Spire elongated, conical, the apex very obtuse. Whorls  $6\frac{1}{2}$ , slightly convex, the last whorl slightly ascending. Aperture small, bluish-fleshy inside; peristome not expanded, hardly thickened, obtuse, fleshy or brownish; columella vertically entering, slightly truncate at base. Alt. 53, diam. 27; alt. of aperture 23 mill.

Cuenca, Ecuador (Paz); Catamayo Valley, Prov. Loxa (Wolf).

*B. hartwegi* PFR. in Phil., Abbild., ii, p. 111, pl. 4, f. 1 (1846); Monogr., ii, p. 140.—REEVE, C. Icon., pl. 29, f. 176.—HIDALGO, Mol. Viage al Pacif., p. 64, pl. 4, f. 4, 5.—*Zebra loxensis* MILL., Mal. Bl. (n. F.) i, p. 119, pl. 12, f. 2.

Distinguished from *S. thompsoni* by the finely wrinkled, not pitted, apical whorls, shorter aperture and straight or convex columella. According to Hidalgo the specimens figured by Philippi and Reeve (which agree with those before me) are not fully mature; the adult having no notch or truncation at foot of columella. I have copied on pl. 26, figs. 81, 83, his illustrations of the adult condition. *S. hartwegi* differs from *S. achilles* in lacking spiral impressed lines.

S. LOXOSTOMUS Pfeiffer. Unfigured.

Shell imperforate, oblong, solid; irregularly striated and closely malleated. Tawny, undulately streaked and maculated with reddish, under a greenish-chestnut epidermis. Spire convex-conic, rather obtuse; suture submarginated. Whorls  $5\frac{1}{2}$ , slightly convex, the last a little shorter than the spire.

Columella arcuate, somewhat folded above, pale orange colored. Aperture oblique, oval; peristome unexpanded, thickened. Alt. 71, diam. 34; aperture alt. inside 35, width in the middle, 17 mill. (*Pfr.*).

Andes of Colombia (Cuming Coll.).

*Bulimus loxostomus* PFR., P. Z. S., 1852, p. 59; Monogr. iii, p. 379; vii, 123.

S. SALTERI Sowerby. Pl. 30, fig. 22.

Shell imperforate, ovate-oblong, rather solid, longitudinally irregularly striate, roughly malleated; tawny, here and there with sparse black-brown rays and irregularly bestrewn brown spots. Spire

lengthened, the apex obtuse; suture irregularly subcrenulate. Whorls 6, slightly convex, the upper minutely granulose, the last whorl longer than spire, oblong, slightly inflated.

Aperture ovate-oblong, pale purplish inside, broadly edged with brown-purple; peristome slightly thickened, hardly reflexed; columella rather straight. Alt. 70, diam. 35 mill. (*Sowb.*).

*Catamarca, Andes of Peru* (S. J. DaCosta coll.).

*Bulimus salteri* SOWB., P. Z. S., 1889, p. 578, pl. 56, f. 4.

*Var.* Hardly malleated; sparingly radiated with brown but not spotted; striæ conspicuous rugose. Alt. 86, diam. 44 mill. (*Sowb.*).

The typical shell has a peculiarly malleated surface, and the indentations are rendered conspicuous by the brown markings. The variety, wanting these characters, presents so different an appearance that it might be taken for a distinct species. There is however, but little difference in form, the coloring of the mouth is the same, the brown rays are also similar in color and disposition. The longitudinal striæ are closer and more regular, taking the place of the irregular indentations characteristic of the typical form (*Sowb.*).

Compare *S. loxostomus* Pfr.

*Group of S. thompsoni.*

Imperforate; the nepionic shell minutely pitted, thimble-like.

*S. THOMPSONI* Pfeiffer. Pl. 27, figs. 91, 92, 93.

Shell imperforate, lengthened-ovate, solid. Yellowish chestnut or olive-brown, with irregularly spaced, unequal narrow blackish-brown streaks, always *rather regularly striped with brown on the upper whorls*. Surface shining, smooth, with wrinkles of growth; the *nepionic shell beautifully thimble-pitted, last nepionic whorl striped*. Spire long, apex very obtuse. Whorls 6, gently convex, separated by non-crenulated sutures, margined by a white line.

Aperture elliptic-acuminate, white or bluish inside; peristome brown, not expanded nor thickened, blunt. *Columella concave* or nearly straight, brown or white.

Alt. 56, diam. 28; aperture, alt. 28 mill. (specimen).

Alt. 70, diam. 33 mill. (*Hidalgo*).

Alt. 41, diam. 21; aperture, alt. 21 mill. (*Pfr.*).

*Nanegal* (Stubel), *Quito and Cuenca, Ecuador*.

*B. thompsonii* PFR., P. Z. S., 1845, p. 74.—*B. thompsoni* PFR., Monogr., ii, p. 141.—REEVE, Conch. Icon., pl. 24, f. 158.—HIDAL-



GO, *Viaje al Pacif.*, p. 63, pl. 6, f. 2, 3.—MARTENS, *Conch. Mittheil* ii, p. 157.—COUSIN, *Bull. Soc. Zool. Fr.* 1887, p. 211, 212 (varr. *olivacea*, *nigricans*, *lutea*, *zebra*).

When immature, this species has a subtruncate columella, like *S. hartwegi*. It is well distinguished by the pitted embryo and the coloration.

*S. YANAMENSIS* Morelet. Pl. 27, fig. 97. \*

Shell imperforate, oblong, solid, rugulose, in part granulated, shining. Greenish-tawny, irregularly streaked with darker. Spire short-conic, the apex obtuse, a little concave. Suture very narrowly white-edged, irregularly crenulated on last whorl. Whorls  $4\frac{1}{2}$ , slightly convex, the earlier denuded of cuticle, impressed-granulate under a lens, roseate; penultimate whorl dot-banded; last whorl larger than spire.

Aperture ample, semi-oval, white inside; peristome somewhat thickened, the right margin nearly straight; columella calloused, short, joining the basal margin at an angle. Alt. 58, diam. 25; aperture, alt. 31, width 16 mill. (*Morel.*).

*Yanama, Peru* (Angrand).

*Bul. yanamensis* MOREL., Sér., *Conch.*, iii, p. 171, pl. 8, f. 3.—PFR., *Monogr.*, vi, p. 87.

More ventricose than *S. thompsoni* and *hartwegi* with fewer whorls and larger aperture.

*S. VIRIATUS* Morelet. Pl. 27, fig. 99.

Shell imperforate, ovate-conic, solid, longitudinally wrinkled. Ashy-violaceous, marked with a few wide livid streaks. Spire rather long, the apex obtuse, reddish. Whorls  $4\frac{1}{2}$ , convex, the earlier smooth; last whorl slightly longer than the spire.

Columella thread-like, rather straight. Aperture oblong-oval, concolored within; peristome simple, unexpanded, the right margin with a wide livid border inside and out; columellar margin somewhat thickened, narrowly reflexed, appressed.

Alt. 57, diam. 28 mill. (*Morel.*).

*Niguapata, in the hot, dry land prevalent in the Santa Anna Valley, Peru* (Angrand).

*Bulimus viriatus* MOREL., Sér. *Conch.* iii, p. 170, pl. 7, f. 4.—PFR., *Monogr.*, vi, p. 105.

Described from two specimens wanting the epidermis. Although the early whorls appear smooth, the lens shows them to be engraved

with fine subreticulate impressions. The following whorls are grooved by wrinkle-striae, which naturally become coarser with the shell's growth. The species is apparently nearest *S. thompsoni*, but it is less lengthened, and not so variegated above.

*S. REQUIENI* Pfeiffer. Pl. 27, fig. 94.

Shell imperforate, oblong-ovate, rather thin; closely striated lengthwise, little shining; olive-brown, somewhat spotted with rufous at the submargined suture. Spire conic, apex obtuse, sub-immersed. Whorls 5, slightly convex, rapidly increasing, the last a little shorter than the spire, obsoletely striated. Columella caloused, lightly arcuate, obsoletely truncated at base of the aperture, which is oval and a little oblique; peristome simple, unexpanded, brown-margined within. Alt. 62, diam. 26; aperture, alt. 32, width in the middle 17 mill. (*Pfr.*).

*Brazil* (Cuming Coll.).

*Bulimus requieni* PFR., P. Z. S., 1852, p. 137; Conchyl. Cab., p. 248, pl. 66, f. 8; Monogr., iii, p. 389.

Seems to belong to the group of *S. thompsoni*, but the apical sculpture is unknown.

*Group of S. inca.*

Perforate or umbilicate, elongated; nepionic shell with fine longitudinal wrinkles, sometimes irregular.

*S. SPIXII* Wagner. Pl. 28, fig. 1.

Shell oblong-ovate, solid, longitudinally striate, subimperforate, covered with a thin cuticle. Whorls 7 to 8, inflated-convex, separated by deep sutures. Spire inflated-conic, with obtuse apex, the length of the last whorl. Aperture ovate, smooth; peristome thickened, the left margin forming an oblique fold at columella; umbilical chink none or very narrow. Color of shell white, with brownish epidermis, the aperture white.

Alt. 2 inches, 1 line; diam. 9 lines. (*Wagn.*).

*Brazil, exact locality unknown* (Spix).

*Bulimus spixii* WAGNER, Test. Bras. p. 11, pl. 10, f. 3.—*Columna bulimea* SPIX, l. c., pl. 10, f. 3 (1827).

? *Bulimus hyalinus* WAGNER, t. c., p. 6.—*B. fragilis* SPIX, t. c., pl. 6, f. 3 (young shell).

? *Bulimus spixi* PFR., Novit. Conch., i, p. 56, pl. 16, f. 5, 6.

? *Bulinus sordidus* KING, Zool. Journ. v, p. 341 (1831).



This form, which seems nearly allied to *S. tæniolus*, *S. brephoides*, and especially *S. inca*, has not been satisfactorily identified, and I have, therefore, repeated the Spix-Wagner description and figure.

Pfeiffer has figured a form (pl. 28, figs. 2, and 3) under this name which he describes as follows :

"Shell imperforate, oblong, solid, striatulate, brownish, irregularly streaked with rufous, and with one whitish band. Spire lengthened, convex-turrit, the apex obtuse; suture impressed, subirregular. Whorls 7, but slightly convex, the last one about  $\frac{3}{4}$  the length, slightly narrowed at base. Columella white, obliquely receding, subplicate, calloused at base. Aperture oblique, acuminate, semi-oval, somewhat pearly inside; peristome straight, somewhat thickened, the right margin lightly arcuate, basal regularly arcuate. Alt. 58, diam.  $20\frac{1}{2}$ , aperture, alt. 24, width  $11\frac{1}{2}$  mill. Brazil."

Whether this is identical with the shell collected by Spix is somewhat doubtful. It should be compared with *S. inca* Orb. The original description of *Bulinus sordidus* here follows:

"T. pyramidalis, transversim striata, fusca; anfr. basali ad suturam subalbido; linea subcentrica pallida; labii vix reflexi margine albo. Long.  $11\frac{5}{8}$ , lat.  $\frac{7}{8}$  poll. Habitat ad Brasiliam (Rio de Janeiro)."

No other information has been published.

*S. INCA* Orbigny. Pl. 28, figs. 10, 11.

Shell lengthened, very obviously perforated, thick; uniform blackish-brown, paler toward the apex; nearly smooth, with some growth-lines; spire much elongated, a little swollen, conic above and rather obtuse; whorls 8-9, quite convex, separated by a deep, nearly smooth or irregular suture. Aperture oval, peristome white, much thickened within; columella thick, straight.

Alt. 77, diam. 31 mill. (*Orb.*).

Near Carcuata, Prov. of Yungas; and ravine of Tutulima north of Cochabamba, northeast of the eastern Cordillera of Bolivia (*Orb.*).

*Helix inca* D'ORB., Mag. de Zool., 1835, p. 16.—*Bulinus inca* D'ORB., Voy. dans l'Amér. Mérid., p. 292, pl. 38, f. 6, 7.—PFR., Monogr., ii, p. 142; iii, p. 324.—REEVE, Conch. Icon., pl. 53, f. 346.—*Bulinus inca* SOWB., Conch. Illustr., f. 67.

Allied to *S. spixii* Wagn.

*S. TÆNIOLES* Nyst. Pl. 28, figs. 8, 9.

Shell ovate-elongate, perforate, thin, the apex obtuse; most finely granulose; tawny-brown. Whorls 7, somewhat convex, separated by a crispate suture margined with a white band; the last whorl ventricose. Aperture ovate, livid within; outer lip white and acute; columella white, oblique, connected with lip by a thin parietal callus. Alt. 45, diam. 20 mill. (*Nyst*).

*South America* (*Nyst*).

*Bulimus tæniolus*, NYST, Bull. Acad. Roy. Brux., xii, 1845, pt. 2, p. 151, pl. 2, f. 4a, b.—REEVE, Conch. Icon., pl. 49, f. 326.—PFR., Monogr., ii, p. 200.

Compare *S. brephoides* Orb.; *S. spixii* Reeve; *S. spixii* Wagner, etc.

*S. BREPHOIDES* Orbigny. Pl. 28, figs. 4, 5, 6, 7.

Shell subperforate, ovate-oblong, solid, striated and subtly granulate-decussated, deep brown, sometimes with a pale peripheral band. Spire convex-conic, obtuse; suture closely crenulated and margined by a wide pale band. Whorls  $5\frac{1}{2}$ , but slightly convex, the last somewhat shorter than the spire. Columella somewhat receding; aperture vertical, semi-oval; peristome straight, thickened; columellar margin dilated, reflexed, subappressed.

Alt. 55, diam. 24; aperture, alt. 26, width 13 mill. (*Pfr.*).

*Peruvian Andes* (Matthews); *Prov. Huancayo, Peru* (Raimondi).

*Helix brephoides* D'ORB., Mag. de Zool., 1835, p. 17.—*Bul. brephoides* D'ORB., Voy. dans l'Amér. Mérid., p. 294, pl. 38, f. 8, 9.—PFR., Monogr., ii, p. 143; Novit. Conch., iii, p. 491, pl. 106, f. 3, 4.

A form with conspicuous bands collected by Raimondi, has been figured by Pfeiffer (figs. 6, 7).

*S. ISERNI* Philippi. Pl. 29, figs. 12, 13, 14.

Shell perforate, oblong-turritid, rather solid, shining, longitudinally striatulate; *blackish-chestnut, with a wide whitish band below suture and another of double that width on the base*, under a very thin green or pale olive cuticle. Spire long-conic, the apex blackish-purple and obtuse; suture minutely plicate. Whorls 6 to 7, nearly flat, the last obliquely descending.

Columella somewhat folded, slightly arcuate, of a livid tint. Aperture oval, rather acuminate above, the inside showing the external coloring, bluish tinted, about two-fifths the total length;



peristome unexpanded, slightly thickened, brown-edged; parietal callus very thin; right margin a little arcuate, columellar margin rather reflexed, half closing the perforation.

Alt. 50, diam. 20 mill. (*Hidalgo*).

*La Oroya and Chanchamayo* (Isern); *Huancaya* (Raimondi, large form).

*Bulimus iserni* PHILIPPI, Malak. Bl., xiv, 1867, p. 75.—PFR., Novit. Conch., p. 338, pl. 80, f. 16–18; Monographia, vi, p. 121.—HIDALGO, Viaje al Pacifico, Mol., p. 67, pl. 6, f. 6, 7.

Smoother and more shining than *S. bifasciatus* with wider light bands. A form from Huancaya is larger, alt. 56, diam. 28 mill., the bands ferruginous-yellow (fig. 13).

*S. JELSKII* Lubomirski. Pl. 27, figs. 95, 96.

Shell subperforate, elongate-ovate, the apex obtuse, striated, translucent, deep tawny with four brown bands, the upper and lower wide, median and sutural very narrow; suture irregularly crenulate plicate. Whorls 6, slightly convex, the last about equalling the spire; columella slightly folded, somewhat twisted.

Aperture oval, oblong, whitish inside; peristome simple, the ends joined by a very thin callus; right margin unexpanded, columellar margin dilated, with a chink behind it, livid. Alt. 35, diam. 15, aperture, alt. 17, width 8 mill. (*Lub.*).

*Amable Maria, near Tarma, Peru* (Jelski).

*Bulimus (Orphnus) jelskii* LUB., P. Z. S., 1879, p. 722, pl. 56, f. 1, 2.

Prince Lubomirski's description of the coloration does not agree very well with his figures, which are copied on our plate. One specimen only was collected.

*S. BITÆNIATUS* Nyst. Pl. 29, figs. 15, 16.

Shell perforate, oblong or ovate-turritid, rather solid, a little shining, sculptured with very close, somewhat undulating longitudinal striæ. Under a very thin pale olive cuticle, it is chestnut colored, with a rather narrow whitish band at the suture and another below the middle of the body whorl, margined below with blackish-chestnut. Spire long-conoid, the apex obtuse, subexcavated; suture a little wrinkled. Whorls 7, rather flat, the earlier 2 seen under a lens to have strong, somewhat spaced keels and folds above; last whorl a little convex, obliquely descending.

Columella subplicate, little arcuate, somewhat purple. Aperture oval, bluish-livid within, two-fifths the shell's length; peristome straight, slightly expanded, livid-reddish, the ends joined by a thin callus; right margin regularly arcuate, columellar margin reflexed, half closing the perforation. Alt. 58, diam. 23 mill. (*Hidalgo*).

*Chanchamayo* (Isern); *Forests eastward from Huancavelica, toward the Apurimac River* (Thamm).

*B. bivittatus* PHIL., Archiv für Naturg. 1845, p. 62 (not *bivittatus* Sowb.).—*B. bifasciatus* PHIL. Abbild. u. Beschreib. ii, p. 10, pl. 3, f. 5 (1847).—MARTENS, Malak. Bl. xiv, 1867, p. 141.—PFR., Monogr. ii, p. 199; iv, p. 487.—HIDALGO, Viaje al Pacifico, Mol. p. 68.—*B. fusiformis* TSCHUDI ms. in Archiv für Naturg. 1852, p. 192.—*B. biteniatus* NYST, Bull. Acad. Roy. Sci. Brux. xii, pt. 2, p. 153 (1845).—? *B. spixii* REEVE, Conch. Icon. pl. 30, f. 182, not of Wagner.—*B. bifasciatus* var. *unicolor* PHIL., Malak. Bl. xvi, 1869, p. 36.

Reeve's *B. spixii*, cited here by Pfeiffer, is a very doubtful synonym. If the original of his figure is normal, it indicates a new species. From present information, it appears that Nyst was the first to change the preoccupied name originally proposed by Philippi. The strong, spaced folds of the earlier whorls are characteristic.

Var. *unicolor* Phil. Form normal, but without trace of the bands.

*Hacienda of Huaribamba, east of Huancayo, Peru.*

S. ALUTACEUS Reeve. Pl. 23, fig. 61.

Shell umbilicated, ovate-conic, solid, longitudinally plicate-striate, subgranulated by spiral impressed lines. Blackish-chestnut, with one white band; spire conic, obtuse; suture impressed, irregularly crenated. Whorls  $6\frac{1}{2}$ , scarcely convex, the last shorter than spire, base rounded.

Aperture subvertical, angulate-oval; peristome somewhat thickened, the right margin slightly expanded, columellar margin much dilated above, vaultingly reflexed. Alt. 35, diam. 13; aperture alt. 16, width 8 mill. (*Pfr.*).

*Cuzco, Peru* (Lobb).

*Bul. alutaceus* REEVE, P. Z. S. 1849, p. 99; Conch. Icon. 72, f. 522.—PFR., Monogr. iii, p. 324.



The entire surface of this shell is sculptured longitudinally with very closely packed crinkled striae. (*Rve.*).

*S. TARMENSIS* Philippi. Pl. 24, figs. 66, 67, 68, 69, 70.

Shell perforate, oblong-turritid, solid, very densely striatulate, rufous-chestnut, sometimes with an obsolete band on the last whorl; whorls 6, slightly convex, the last three-sevenths the alt.; apex obtuse, suture profound, subcrenulated.

Aperture pear-shaped-ovate; columella subpiculate, oblique; peristome unexpanded, slightly thickened, the columellar margin dilated above, half closing the perforation; callus joining the lip-ends distinct. Alt. 28, diam nearly 13; aperture, alt. 13, width inside nearly 7 mill. (*Phil.*).

*Oroya*, not far from Tarma, Peru (Raimondi); Chanchamayo (Isern).

*Bulimus tarmensis* PHIL., Malak. Bl. xiv, p. 70, 1867.—PFR., Novit. Conch. p. 343, pl. 81, f. 9, 10; Monogr. vi, 87.—HIDALGO, Viaje al Pacif., Mol., p. 114, pl. 4, f. 8, 9.—*Bulimus alutaceus* var. MORELET, Ser. Conch. iii, p. 181, pl. 7, f. 5.

Figures 68, 69 are typical; fig. 70 is the form collected by the Spanish expedition, and seems stumper. Hidalgo says "very densely striatulate and sometimes with inconspicuous, spaced, most finely granulose spiral lines." The form figured by Morelet (figs. 66, 67) as a variety of *B. alutaceus* Rve. has been referred to *tarmensis* by Hidalgo, I believe correctly. It is smaller than *alutaceus*, alt. 24, diam. 11 mill., with  $5\frac{1}{2}$  whorls; dark red, or chestnut brown more or less intense, sometimes with one or several bands, spiral striae absent.

*S. PORPHYREUS* Pfeiffer. Pl. 29, figs. 18, 19, 20, 21.

Shell perforate or umbilicate, oblong-attenuated, solid. Dark brown, with many narrow, irregular whitish streaks, often showing obscurely a dark peripheral girdle edged with lighter on both sides. Surface very rudely and irregularly wrinkled, the nepionic whorls showing coarse separated irregular wrinkles more or less broken and branching. Spire exerted, conic, the apex very obtuse. Whorls 7, but slightly convex.

Aperture small, ovate, brown and whitish inside; peristome white, slightly thickened, the basal lip a little expanded; columella

*well reflexed*, openly vaulted over umbilicus, widened above, *not in the least folded*; parietal callus slight.

Alt. 61, diam. 27; alt. of aperture 29 mill.

Alt. 56, diam. 25 mill.

*Andahuaylas* in rock-crevices (Angrand) and *Lima* (Bland), *Peru*; (*Bolivia*?).

*Bulinus porphyrius* PFR., P. Z. S. 1846, p. 114.—REEVE, Conch. Icon. pl. 15, f. 89*a*, *b*.—HUPE in Castelnau's Exped. Moll. p. 31, pl. 5, f. 2.—*B. porphyreus* PFR., Monogr. ii, p. 199; iii, p. 425, etc.—MORELET, Ser. Conch. iii, p. 173.—HIDALGO, Viaje al Pacif., Mol. p. 65.—MARTENS, Conchol. Mittheil. iii, p. 11, pl. 40, f. 11, 12.

The rudely wrinkled surface, open umbilical perforation and peculiar sculpture of early whorls are characteristic. The structure of the columella is quite different from that of *S. achilles*, to which this species is not much allied.

S. JASPIDEUS Morelet. Pl. 29, fig. 17.

Shell narrowly umbilicated, oblong-oval, moderately solid, wrinkle-striated, irregularly granulate and marked with a few concentric lines. Longitudinally streaked and variegated with whitish and corneous. Spire convex-conic the apex rather acute. Whorls 6, slightly convex, plicate-crenulate at the sutures, the last whorl shorter than the spire.

Aperture vertical, ovate; peristome somewhat thickened, unexpanded, the right margin regularly arcuate; columellar margin dilated, spreading. Alt. 37–47, diam. 18–21 mill. (*Morel*).

*Valley of Yucay*; around *Huancabelica*, on garden walls (Angrand).

*Bul. jaspideus* MOREL., Sér. Conch. iii, p. 180, pl. 7, f. 7.—PFR. Monogr. vi, p. 142.



Family *BULIMULIDÆ*.

= *Bulimulidæ* + *Orthalicidæ* of authors.

Shell varying from well developed, oblong, ovate, conic or cylindrical, and capable of containing the retracted soft parts, to *Succinea*-like, or depressed, few whorled, and incapable of containing the soft parts.

External characters of animal as in *Helicidæ*. Genitalia rather simple, the penis with or without a flagellum or an accessory gland or "appendix." Jaw composed of vertical or oblique imbricating plates, sometimes forming a triangular median piece composed of one or several plates, or sometimes by thickening of the plates having an odontognathous appearance. Radula fundamentally as in *Helicidæ*, but variously modified.

Habits arboreal or terrestrial. Genera about fifteen, inhabiting tropical and subtropical America, and in the Old World extending from Tasmania and Australia to China, and eastward in Polynesia to the Society Islands.

An extensive family, comprising the dominant groups of South American land snails, and abundantly represented in the Orient by *Placostylus*, *Partula*, *Amphidromus*, etc. As only a portion of the genera will be discussed in this volume, the consideration of the geographic and geological distribution and the anatomy, as well as synoptical keys to the genera and subgenera, will be reserved for the Introduction to a later volume.

The several genera will now be monographed, beginning with those South American groups having greatest similarity in shell characters to the Bulimoid *Helicidæ*. This proximity must be clearly understood to be a grouping of convenience only, indicative of no natural affinity.

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Genus *PLEKOCHAILUS* Guilding, 1828.

*Plekocheilus* GUILDING, Zoological Journal, iii, p. 532, type *P. undulatus*=*auris silenii*.—*Caprella* Guilding olim, not Lamarck.—*Bulimus*, in part, of previous authors.+*Eurytus* ALBERS, Die Hel., p. 169, 1850.

For anatomy see SCHAKO, Festschrift zur Feier des 100-jährigen Bestehens der Gesell. Naturforsch. Freunde zu Berlin, 1873, p. 173 (jaw and teeth of *blainvillæanus*). BINNEY, Ann. N. Y. Acad. Sci.,

iii, pp. 114, 115 (jaws and teeth of *auris-sileni*, *aulacostylus*. SEMPER, Reisen im Archip. Phil., Landmoll., p. 150 (soft anatomy of *loveni* and *blainvillanus*).

Shell "Bulimoid," ovate or ovate-acuminate, usually solid and opaque; zig-zag streaked or dappled with brown on a lighter ground, or variegated with whitish over brown or yellow, rarely unicolored; the surface wrinkled, striated or granulose. Nepionic shell small. Aperture ovate, the lip reflexed, expanded, or blunt; columella reflexed or narrow, with a spiral fold or none.

Left mantle-edge with two anterior lobes; kidney very short, triangular. Genitalia simple, the spermatheca duct long, *penis bearing a long flagellum*. Jaw vertically striated by the edges of numerous narrow, imbricating, slightly oblique united plates. Radula with the rhachidian tooth bearing a long middle cusp only, or middle cusp shorter, and side cusps developed; lateral and marginal teeth with two cusps.

Distribution, northwestern South America (British Guyana, Venezuela, Colombia, Ecuador and Peru, with adjacent portion of Bolivia); Islands of St. Vincent and St. Lucia.

This group has hitherto been incorporated in the restricted genus *Bulimus* of authors, with *Borus*, *Strophocheilus*, *Orphnus* and *Dryptus*; but these groups I have shown to possess the common character of a relatively very large nepionic shell. In other words, the embryo undergoes a greater amount of development within the egg, the latter containing a considerable quantity of nutriment. In consequence of this, the individual eggs are of large size and few in number. On the other hand, *Plekocheilus* and the genera which will follow, reproduce by smaller eggs, the young at the time of hatching being relatively minute. The nature of the jaw also separates this genus from *Borus* and its allies; the latter having a solid, ribbed or smooth jaw like the *Helices*, while *Plekocheilus* has a jaw of the finely laminated type common in *Bulimulidæ*.

The Martensian classification is, therefore, clearly erroneous. In transferring the genus from *Helicidæ* to *Bulimulidæ*, attention may be directed to the structure of the jaw, which is like many species of *Otostomus*; the teeth and genitalia which resemble those of some *Bulimulus*; while the shell is either more solid than in those genera, or its reflexed lip offers a differential character.



*Subgeneric divisions.*

Two rather closely allied sections compose this genus:

1. *PLEKOCHAILUS s. str.*, in which the shell is wrinkled or malleated, spire costulate. (Page 64).

2. *EURYTUS*, shell granulate or striate, rarely almost smooth. (Page 69).

The second of these groups has an extended range southward in the elevated regions of Colombia, Ecuador, Peru and Bolivia, where the typical group does not extend.

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Section *PLEKOCHAILUS* Guilding, 1828.

*Plekocheilus* GUILDING, Zoological Journal iii, p. 532 (1828), type and sole species *P. undulatus*=*aurissileni*.—*Pelekocheilus* BECK (in part) Index, p. 55.—*Pelecocheilus* ALB., (first species only) Die Hel., p. 151.—*Pelecyccheilus* MART., (exclusive of type and all but last species) Die Hel. 1860, p. 188.—*Plecocheilus* H. & A. ADS., (first species only) Gen. Rec. Moll., ii, p. 147.—*Plecocilus* AGAS., Nom. Zool. Ind. Univ., Moll. (1847).—*Plecocheilus* M. E. GRAY, Figs. Moll. Anim., pl. 74, f. 1.—*Caprella* GUILDING, Trans. Linn. Soc. London, xiv, 1825, p. 341, type *C. undulata* (*aurissileni*). Not *Caprella* Lam., 1801.—*Pupa*, *Auricula*, *Carychium*, *Voluta* and *Bulinus* sp. of some authors.

Shell ovate or ovate-acuminate, solid, *roughly sculptured with dense longitudinal wrinkles broken by oblique or irregular malleation, the spire longitudinally costulate; nepionic shell small, most minutely granose; aperture ovate, the lip well reflexed; columella dilated above, with a weakly convex oblique entering fold, which sometimes bears a strong or slight white callus fold.* Type *S. aurissileni*.

*Plekocheilus* has been misunderstood by Martens, Pfeiffer and other systematists, who restrict it to the group of *B. distortus* Brug.

The group of *B. speciosus*, which I have left in the next section, *Eurytus*, may perhaps as naturally be placed here; but there is a difference in the structure of the columellar fold. In *Plekocheilus* this fold when strong is formed by a callus superimposed upon the rather weak columellar convexity, and added only when the individual is quite mature.

*Key to Species.*

- a. Striped in zigzag or zebra pattern.
  - b. Columellar fold very strong; peristome white; dark and light stripes of equal width, *aurissileni*.
  - bb. Columellar fold weak; peristome brown; dark stripes narrow.
    - c. Quite obese, spire short, *blainvilleanus*.
    - cc. Slenderer, spire more produced, *fulminans*.
- aa. Shell unicolorous or without zigzag stripes, columella with no fold of callus.
  - [b. Uniform pink; lip white or lilac, *pudicus*, *antea*, p. 6.]
  - bb. Brown, the peristome brownish-orange, *appunii*.
  - bbb. Streaked and spotted obliquely, *lugubris*.

P. AURISSILENI Born. Pl. 22, figs. 57, 58.

Shell ovate or obovate, perforate or umbilicate, solid and strong, yellow or smoky-brown with longitudinal *zebra-stripes of deep brown as wide as their intervals*, and usually somewhat oblique or zigzag. Surface finely sculptured with *short, fine vertical wrinkles, cut into spiral lines and bands* by impressed spirals; and over this closely malleated on the upper part of the body-whorl; spire with close, oblique riblets except earlier 2 whorls which are densely granulated. Whorls slightly over 4, rapidly increasing, *the last compressed at periphery on its latter half*. Suture shallow, becoming deeper and obliquely descending on last whorl.

Aperture vertical, ear-shaped, blue- or flesh-white inside; peristome well reflexed, white. Columella dilated above, adults bearing a *very strongly projecting, twisted, spirally entering fold above*.

Alt. 44, diam.  $25\frac{1}{2}$ , alt. of aperture  $28\frac{1}{2}$  mill.

*Island of St. Vincent, West Indies.*

*Voluta auris Sileni* BORN, Test. Mus. Caes. Vindob., p. 212, pl. 9, f. 3, 4.—GMEL., Syst. Nat. (13), p. 3436.—DILLWYN., Discr. Catal., i, p. 502.—*Bulimus auris Sileni* BRUG., Encycl. Méth., i, p. 345.—KUSTER. Conchyl. Cab., p. 46, pl. 14, f. 3, 4.—PFR., Monogr., ii, p. 87; iii, 316; iv, 380; vi, 23; Conchyl. Cab., pl. 22, f. 9.—REEVE, Conch. Icon., pl. 25, f. 164.—*Auricula caprella* LAM., An. s. Vert., viii, p. 140.—SOWB., Conch. Man., f. 522, 523.—*Pupa caprella* GRAY, Ann. of Philos. n. ser., ix, p. 412.—*Carychium undulatum* LEACH, Zool. Misc. i, p. 37.—*Plekocheilus undulatus* GUILDING, Zool. Journ.





iii, 1828, p. 533.—SWAINS., Zool. Illustr. (2d ser.), ii, p. 103 (with animal).—*Pelekocheilus sileni* BECK, Index Moll., p. 55.—*Auricule chevrotin* CHENU, Leç Elém., p. 243, f. 909.

A very distinct species. In young shells (see pl. 22, fig. 58), the outer lip becomes reflexed and the other features of maturity are assumed before the strong fold of the columella is added, just as in *fulminans* and *blainvilleanus*. The pattern of sculpture and features of the nepionic shell are also the same as in the *fulminans* group, of which this species is undoubtedly a member.

*P. FULMINANS* Nyst. Pl. 31, fig. 33.

Shell acutely long-ovate, moderately solid, imperforate; brown or yellowish-brown, *with narrow zigzag dark stripes. Surface closely and strongly ribbed on spire, the body-whorl with close vertical wrinkles interrupted by obliquely descending ridges* produced by a more or less confluent malleation. Whorls  $4\frac{1}{4}$ , those of spire nearly flat, the last feebly convex above, its suture rapidly and obliquely descending.

Aperture not much over half the length, liver-brown inside; peristome well reflexed, thick, liver-brown; columella with a projecting, entering fold above.

Alt. 53, diam. 29; alt. of aperture 29 mill.

*Province Cumana, Venezuela (Funck) Cave of Guacharos, near Caripé, Colombia.*

*B. fulminans* NYST, Mém. Soc. Roy. Sci. de Liège, i, 1843, p. 261, pl. 7, f. 1.—REEVE, C. Icon., pl. 24, f. 160a.—DESH. in Fér. Hist., p. 49, pl. 130, f. 11, 12.—PFR., Monogr., ii, p. 25; vi, p. 12.—MARTENS, Binnenmoll. Venez., p. 17.—SOWERBY, P. Z. S. 1889, p. 582 (with var. *linteræ*).—*B. bellulus* JONAS, Zeitschr. f. Malak., 1844, p. 36; Molluskolog. Beitr., p. 25, pl. 11, f. 18.—PHIL., Abbild., ii, p. 9, pl. 3, f. 3.

In *fulminans* the convex lobe of the columella in fully adult shells is longer than in *P. blainvilleanus*. The aperture is smaller; outer lip less arcuate above, spire slenderer and more produced.

Von Martens many years ago, included *blainvilleanus* and *loveni* in *fulminans* as varieties; and recently Sowerby has expressed the same opinion. It is extremely likely that these forms are only geographic varieties, but in the absence of specimens actually connecting them, it may be as well to allow them to stand as species for the pre-

sent. The convex fold of the columella is not added until complete maturity is attained, so that some apparently adult shells are without it; and in this condition the species are still more alike.

Var. LINTERÆ Sowerby. Pl. 31, fig. 32.

Smaller than the type, about the size of *loveni*, than which it is more solid, with a more produced spire and narrower body-whorl. The zigzag markings are only faintly visible in some specimens. (*Sowb.*, P. Z. S., 1889, p. 582, pl. 56, f. 12).

*Mount Roraima, British Guiana.*

P. BLAINVILLEANUS Pfeiffer. Pl. 31, figs. 29, 30, 31.

Shell ovate, perforated, solid; yellowish-brown or reddish, with narrow zigzag stripes. Surface ribbed on spire, the body whorl vertically wrinkled and strongly malleated. Spire short, acute; aperture much over half the shell's length, brown with a pearly luster within, the peristome broadly reflexed, outer lip well curved above; columella with a short callus fold built upon the middle of the rather weak entering fold above.

Alt. 58, diam. 33, alt. of aperture 36 mill.

Alt. 43, diam.  $25\frac{1}{2}$ , alt. of aperture 25 mill.

*Puerto Cabello, Venezuela* (Swift); *Zaji, Prov. Merida, U. S. of Colombia* (Funck).

*B. blainvilleanus* PFR., P. Z. S., 1847, p. 230; Monogr., ii, p. 45.—PHIL., Abbild., iii, pl. 8, f. 1.—REEVE, Conch. Icon., pl. 25, f. 161.—SEMPER, Reisen im Archipel Phil., Landmoll., p. 150, pl. 15, f. 1; pl. 17, f. 4 (anatomy).—*B. fulminans* var. *blainvilleanus* MARTENS, Binnenmoll. Venez., p. 17.—SOWB., P. Z. S., 1889, p. 582.

More ventricose than *fulminans*, stouter, the superadded callus of columella shorter. The specimen drawn in fig. 31 has not added the columellar callus.

Var. LOVENI Pfeiffer. Pl. 31, figs. 36, 37.

Shell similar to *P. blainvilleana* in form, but smaller, thin, the riblets of penult. whorl extending upon front of body whorl; whorls  $4\frac{1}{2}$ . Columella without an added callus fold. Alt. 38, diam. 23; alt. of aperture 22 mill.

*Colony of Tovar* (Dyson); and *Puerto Cabello* (Bland); *Venezuela*.



*B. loveni* PFR., P. Z. S., 1847, p. 229; Monogr., ii, p. 26.—PHIL., Abbild., iii, p. 35, *Bulimus* pl. 8, f. 6.—SEMPER, Reisen, etc., p. 150, pl. 17, f. 3 (anatomy).—*B. fulminans* var. *loveni* MARTENS, Binnenmoll. Venez., p. 18.

*P. LUGUBRIS* Dunker. Pl. 37, figs. 95, 96.

Shell ovate, subimate, rather thin. Whorls 5, slightly convex, rapidly increasing, the last three-fifths the entire length; longitudinally somewhat wrinkled and transversely densely striated. Deep brown, variegated with irregular spots and streaks under a translucent black-olive epidermis. Columella a little sinuated; aperture oblong-ovate, blackish and very glossy; peristome somewhat thickened, reflexed. Length 51, width 28 mill. (*Dkr.*).

*Pasto, in southern Colombia* (F. C. Lehmann).

*Bulimus lugubris* DKR., Jahrb. D. M. Ges., xi, 1882, p. 378, pl. 11, f. 1, 2.

Allied to *B. blainvilleanus* Pfr., but with different sculpture and lacking the columellar fold; the color darker, with irregular spots and streaks, and without lightning lines.

*P. APPUNI* Dunker. Pl. 31, figs. 34, 35.

Shell ovate-acuminate, narrowly umbilicated, rather solid, irregularly longitudinally striated, roughened, as if malleated all over; unequally plicate below the suture. Unicolored pale brown, covered with a brownish-corneous or greenish epidermis. Whorls  $5\frac{1}{2}$ , convex, separated by a rather deep suture; the last whorl somewhat swollen, about three times longer than the spire; columella slightly folded, a little receding. Aperture ovate, slightly oblique; peristome thickened, expanded, more or less reflexed, brownish-orange. Length 60–65, diam. 34–36; aperture, alt. 34–35, width 18 mill. (*Dkr.*).

*Sierra Nevada di Sta. Marta, U. S. of Colombia* (Tetens).

*B. appuni* DKR., Jahrb. D. M. Ges., ii, 1875, p. 220, pl. 6, f. 1, 2; Nachrbl. D. M. Ges., vii, 1875, p. 29.—PFR., Monogr., vii, p. 33.

This snail belongs to the group *Dryptus* Alb., and is nearest allied to *B. blainvilleanus* Pfr., though its general aspect reminds one of small varieties of *B. moritzianus*. It seems to vary in form judging by the two well preserved specimens before me, the shorter one by 5 mill. is 2 mill. wider than the longer shell. (*Dkr.*).

## Section EURYTUS Albers, 1850.

*Eurytus* ALB., Die Hel., 1850, p. 169; Edit., 1860, p. 195, type *B. pintadinus* Orb.

Shell ovate or elongated, varying from rather thin to solid and either *granulated*, transversely striate or longitudinally rib striate. Aperture exceeding half the alt. of shell; peristome varying from reflexed to simple and unexpanded; columella with or without a fold. Type *Bulimus pintadinus* Orb.

The objection may reasonably be lodged against the above diagnosis that it is sufficiently loose to admit almost any *Bulimus*; but so diverse are the elements of *Eurytus* that no more exact definition will cover all of them. At the same time, I am unwilling to split the group into several new sections. It is always doubtful whether the greater definiteness of idea obtained by disintegrating such a group as this into named sections, will recompense for the additional brain burden of carrying the machinery of nomenclature.

*Key to groups of species.*

- I. Shell solid; lip reflexed; columella with a strong fold above.  
Group of *P. speciosus*.
- II. Shell thin, *smooth*; columella with a lunate groove at root.  
Group of *P. aulacostylus*.
- III. Columella not strongly folded or grooved.
  - a. Lip well expanded or reflexed.
    - b. Without creamy epidermal stripes,  
Group of *P. coloratus*.
    - bb. Epidermis with creamy, papery variegation,  
Group of *P. succinoides*.
  - aa. Lip blunt, unexpanded or but slightly so.
    - b. Ovate; suture hardly descending in front,  
Group of *P. castaneus*.
    - bb. Ovate; suture deeply descending in front,  
Group of *P. taylorianus*.
    - bbb. Elongated species, Group of *P. floccosus*.

*Group of P. speciosus.*

Ovate, smoothish, granulated or malleated, subperforate, solid; the peristome expanded and reflexed; columella with a strong, oblique fold above.



Of this division I have seen only *P. speciosus*. It may well be questioned whether the group does not belong to *Plekocheilus*.

*P. SPECIOSUS* Pfeiffer. Pl. 30, figs. 27, 28.

Shell narrowly perforate, ovate, rather solid, longitudinally plicate, *very minutely granulate* and obliquely malleate; olivaceous-brown, with scattered reddish spots. Spire short, conic, rather obtuse; suture subcrenulate, pale. Whorls 4, moderately convex, the last forming nearly two-thirds of the alt. of shell, rounded at base; columella lightly folded, whitish. Aperture little oblique, acuminate-oval, plicate within, and bluish, shining; peristome brown-orange, somewhat thickened throughout, *expanded and recurved*, the terminations joined by a transparent parietal callus; columellar margin dilated. Alt. 58, diam. 30 mill.; aperture, inside alt. 35, width  $18\frac{1}{2}$  mill. (Pfr.).

*Sierra Nevada di Sta. Marta* (Schlim).

*B. speciosus* PFR., P. Z. S., 1854, p. 290; Novit. Conch., i, p. 14, pl. 5, f. 1, 2; Monogr., iv, p. 377.—DOHRN, Jahrb. D. M. Ges., ii, 1875, p. 304.—MOUSS., Malak. Bl., xvi, 1869, p. 173.

Mousson records *B. speciosus* from the lower Magdalena Valley (coll. by Wallis), and measuring 53 mill. alt. The single specimen before me is from Pamplona, U. S. of Colombia. Dohrn reports specimens lacking the color spots.

*P. PLECTOSTYLUS* Pfeiffer. Pl. 32, figs. 44, 45.

Shell subperforate, ovate-conic, solid, regularly and distinctly granulated; deep chestnut, with short, white flames under the suture. Spire conic, rather obtuse. Whorls 5, slightly convex, the upper ones plicate-striate, the last whorl swollen, very obliquely descending in front, about four-sevenths the shell's length. Columella with a strong suboblique fold above. Aperture reversed-ear-shaped, dull lilac inside, shining; peristome expanded and reflexed throughout, livid brown. Alt. 35, diam. 17; aperture, alt. 22, width of cavity below the fold, 10 mill. (Pfr.)

*Chachopo, Prov. Merida, U. S. of Colombia* (Funck).

*B. plectostylus* PFR., Monogr., ii, p. 48; P. Z. S., 1847, p. 230.—PHIL., Abbild., iii, p. 36, pl. 8, f. 7.—REEVE, C. Icon., pl. 42, f. 268.—DOHRN, Jahrb. D. M. Gesell., ii, 1875, p. 304.

Dohrn found a more ventricose form in the collection made by Wallis. He gives these measurements:

Alt. 40, diam. 23 ; aperture, alt. 23, width 15 mill.

Alt. 44, diam. 24 ; aperture, alt. 23, width 17 mill.

Alt. 43, diam. 26 ; aperture, alt. 25, width 18 mill.

Alt. 50, diam. 33 ; aperture, alt. 33, width 21 mill.

"The color is sometimes dark brown with lighter streaks near the suture ; sometimes the whole epidermis is made up of fine brown and dull straw-yellow zig-zag streaks ; and others are entirely light brown like *B. fulminans*. The lip is either leather-colored or flesh-reddish, or whitish with colored edge. The slender form is very near *B. subglandiformis*."

*P. CONTORTUPLICATUS* Reeve. Pl. 19, fig. 39.

Shell hardly perforate, oblong, solid, minutely malleated and under a lens very subtly granulated. White, covered with a thin, shining greenish-corneous cuticle. Spire lengthened-conic, the apex rather obtuse ; suture with an impressed margin. Whorls 5, but little convex, the last descending, a little longer than the spire, rounded at base. Columella white, folded, receding. Aperture subvertical, oblong ear-shaped ; peristome white, thickened, expanded and reflexed. Alt. 67, diam. 27 mill. ; aperture with peristome 36 mill. long, 15 mill. wide in the middle inside. (*Pfr.*)

*Prov. Minas Geraes, Brazil* (Miers).

*B. contortuplicatus* REEVE, Conch. Icon., pl. 88, f. 658 (Feb., 1850).  
—PFR., Monogr., iii, p. 314.

This species is compared by Reeve to *B. pudicus*, and it may prove to be allied to that species rather than to the present group.

*P. GUILDINGI* Dohrn. Pl. 30, figs. 25, 26.

Shell narrowly perforate, acuminate-ovate, rather solid, *smoothish*, shining, tawny or chestnut colored, variously marbled with the whitish-straw-colored deciduous epidermis. Spire elongate-conic, rather acute. Whorls  $4\frac{1}{2}$ –5, but little convex, the last fuller, descending in front ; columella oblique, with a strong fold, white. Aperture acuminate-ovate, scarcely oblique ; peristome expanded throughout, thickened, white. (*Dohrn.*)

Alt. 43, diam. 21 ; aperture, alt. 25, width 16 mill.

Alt. 40, diam. 22 ; aperture, alt. 24, width 16 mill.

Alt. 42, diam. 19 ; aperture, alt. 23, width 14 mill.

*New Granada* (Wallis).



*B. (Plekocheilus) guildingi* DOHRN, Jahrb. D. M. Ges., ii, 1875, p. 306, pl. 10, f. 5, 6; Nachr. D. Malak. Ges., vii, 1875, p. 57.—PFR., Monogr., viii, p. 34.

In the structure of columella and lip, this species is near *B. aurisileni*; but the surface is said to be smoothish (*laevigata*).

Var. GUENTHERI Sowerby. Pl. 30, figs. 29, 30.

Shell narrowly perforated, ovate, solid, smooth; brown, painted with irregularly angular and wavy whitish flames. Spire conic, rather short, the apex a little obtuse; whorls  $4\frac{1}{2}$ , convex, the last two-thirds the total length, inflated, rounded at base. Columella nearly vertical, provided with a thickish oblique fold; aperture oval, slightly oblique, gray-brown inside; peristome thick, reflexed, the margins joined by a thickish callus. Alt. 41, diam. 26 mill.; aperture, alt. 22, width 12 mill. (*Sowb.*).

U. S. of Colombia.

*Bulimus guentheri* SOWB., P. Z. S., 1892, p. 296, pl. 23, f. 7, 8.

This species is remarkable for the smoothness of its surface, having neither granules nor striae. In form it somewhat resembles *B. cardinalis* Pfr., while its markings are like those of a variety of *B. succinoides* Petit. (*Sowb.*). Type in British Museum.

Group of *B. aulacostylus*.

Ovate, smooth, thin, umbilicated, with thin, expanded outer lip; columella broad, with a crescentic furrow at its root.

P. AULACOSTYLUS Pfeiffer. Pl. 27, fig. 98.

Shell openly rimate-umbilicate, ovate, *thin*. Color varying from light buff to dark red-chestnut irregularly sprinkled with chestnut spots and flecks, often oblique, and on dark specimens hardly visible. Surface lustreless but *smooth*, showing under a lens *delicate, close, very superficial spiral striae*. Spire short. Whorls  $4\frac{1}{2}$ , the first with sunken tip, delicately vermiculate-striate outside; last whorl large, oval.

Aperture long-ovate, showing the external coloring within; peristome thin, fleshy-purple or pale, well expanded; columella widening above and *at its junction with body-whorl a deep crescentic channel is excavated*. Parietal callus a mere transparent film. Alt.  $33\frac{1}{2}$ , diam. 19 mill.

Island of St. Lucia, West Indies.

*Bulimus aulacostylus* PFR., P. Z. S., 1852, p. 59; Conchyl. Cab., p. 114, pl. 35, f. 5, 6; Monogr., iii, p. 316; iv, p. 380; vi, p. 23; viii, p. 37.—TATE, Ann. Mag. Nat. Hist., 1869, vi, p. 356.—BLD., Ann. Lyc. Nat. Hist. N. Y., vi, 1858, p. 153.—SMITH, Ann. Mag. N. H., 1889, iii, p. 403.—*B. lentiginosus* REDFIELD, Ann. Lyc. Nat. Hist. N. Y., vi, p. 14 (1853).

The furrow at root of columella is characteristic; the sculpture not less so. Size and comparative width vary somewhat, and the coloring is changeable within wide limits. It has been reported from Trinidad and Demerara, but apparently incorrectly. A specimen 43 mill. long is recorded by Smith.

*Group of B. coloratus.*

Ovate, granulated or decussate, the peristome narrow, expanded or reflexed; columellar fold weakly convex.

*P. ROSEOLABRUM* Smith. Pl. 38, fig. 97.

Shell very narrowly rimate, ovate, acuminate above; minutely granose-striate throughout; ochraceous, irregularly ornamented with scattered spots and oblique streaks. Whorls  $4\frac{1}{2}$ , nearly flat, rapidly increasing, the last whorl large, obliquely descending in front. Suture crenulated.

Aperture oval, acuminate above, whitish-ochraceous inside, a little less than two-thirds the length of shell; columella oblique, arcuate, visible as far as the apex; peristome roseate, narrowly expanded and reflexed throughout, the margins joined by a thin callus. Alt. 42, diam. 18 mill.; length of aperture 26, width 14 mill. (Smith).

*Malacatos, south Ecuador.*

*Bulimus (Eurytus) roseolabrum* E. A. SMITH, P. Z. S., 1877, p. 362, pl. 39, f. 8.

*B. piperitus* of Sowerby is the nearest ally of this species. From that form the present one differs in being smaller and consisting of a whorl less. The granulous sculpture is also different, and does not display that transverse direction which is noticeable in *B. piperitus*. The brown spotting is far less abundant; the general tint is yellower; and the peristome is rose-colored and everywhere expanded and reflexed, which is not the case with Sowerby's species, in which it is usually white and scarcely shows any expansion or reflexion; however, I have seen some specimens of the Peruvian *B. piperitus* with a pink lip. (Smith).



This species and the next seem to belong in the immediate vicinity of the rather stouter *P. coloratus* Nyst. Cousin (Bull. Soc. Zool. Fr. 1887, p. 208) thinks *roseolabrum* a rose-lipped form of *corydon*.

*P. EROS* Angas. Pl. 38, figs. 98, 99.

Shell imperforate, oblong-ovate, thin. Very finely and closely shagreened all over, the apical whorls marked with irregular longitudinal striæ. Light greenish-olive, ornamented with small spots and cloudy patches of a darker color. Spire very short, apex obtuse, pink. Whorls 4, rather convex, the last large.

Aperture ovate, more than two-thirds the length of the shell, effuse below; outer lip slightly expanded and reflexed, which together with the columella and the interior of the aperture, is of a bright rose color. Alt. 36, diam. 17 mill. (*Angas*).

*Ecuador.*

*Bulimus (Eurytus) eros* ANG., P. Z. S., 1878, p. 312, pl. 18, f. 6, 7.

A beautiful species, characterized by its closely granulated sculpture, and the rosy coloration of the mouth. (*Ang.*).

The aperture is larger than in *P. roseolabrum* Smith.

*P. COLORATUS* Nyst. Pl. 32, figs. 41, 42, 43.

Shell perforated, ovate, varying from thin to solid; straw-yellow or pale buff, with scattered spots or irregular streaks (formed by coalescence of spots) of dark brown, light-edged on the left side in the typical form. Surface dull, wrinkle-striate and very densely granulate, the granules following the wrinkles to some extent. Spire conic; whorls  $4\frac{1}{2}$ , the first planorboid, the next minutely criss-cross granulate; last whorl large, its latter third descending.

Aperture ovate, *showing the color-pattern inside*. Peristome expanded and reflexed, rose-pink. Columella widened and folded above, and with the light or heavy parietal callus, pink.

Alt. 45, diam. 26; aperture, alt.  $27\frac{1}{2}$  mill.

Alt. 56, diam. 36; aperture, alt. 35 mill.

*U. S. of Colombia, in Magdalena Valley (Wallis); Prov. Ocana (Schlim); near Quito, Ecuador (Latre).*

*B. coloratus* NYST, Bull. Acad. Roy. Brux., xii (1), p. 228, pl., f. 2 *a, b* (1845).—PFR., Monogr., ii, p. 48; iii, p. 314; iv, p. 377; vi, p. 22; Novit. Conch., i, p. 29, pl. 8, f. 4, 5.—REEVE, Conch. Icon., pl. 24, f. 155.—MOUSS., Malak. Bl., xvi, p. 173, 1869.—DOHRN, Jahrb. D. Malak. Ges., ii, 1875, p. 302.

The typical form of this species is rather thin and beautifully variegated with dark spots (often coalescent into irregular streaks) bordered on the left with light; and in the aperture this pattern is conspicuous. It is connected, however, by intermediate specimens with the following:

Var. LAMARCKIANUS Pfr. Pl. 32, fig. 38.

More solid and opaque, dark chestnut with few small scattered darker spots, mostly oblique, and hardly showing within the dark fleshy-brown aperture. Spire often superficially subplicate.

Alt. 48 to 62 mill.

Andes of U. S. of Colombia, 8,000 ft. alt. (Funck); *La Esperanza estate, near Rio Negro* (Bland).

*B. lamarkianus* PFR., P. Z. S., 1847, p. 229; Monogr., ii, p. 45.—REEVE, Conch Icon., pl. 24, f. 156.—BLAND in C. B. Ad., Contrib. to Conch., No. 12, p. 231.—MOUSS., Malak. Bl., xvi, p. 173 (1869).

Reeve's figure, which I have copied, represents a specimen somewhat larger and more obese than those before me, from Cum-  
ing and Bland.

Var. AMPULLAROIDES Mousson. Pl. 32, figs. 39, 40.

Larger than *B. coloratus*, more convex above, the spire shorter, suture deep and umbilicus wider. Tawny-buff, with indistinct brown spots. Alt. 73, diam. 55 mill.

*Bogota* (Wallis).

*B. ampullaroides* MOUSS., Malak. Bl., xxi, 1873, p. 8.—PFR., Novit. Conch., iv, p. 132, pl. 130, f. 1, 2.—Conf., DOHRN, Jahrb. D. M. Ges., ii, 1875, p. 303, 304.

This is regarded by Dohrn, evidently with justice, as an extreme form of *coloratus*. It approaches *P. gibbonius* in size, but is completely distinct from that species in the shorter spire, greater convexity of the whorls above, colored columella, etc.

P. GIBBONIUS Lea. Pl. 33, fig. 46.

Shell umbilicate, very ventricose, solid; chestnut-brown with scattered darker spots, sparser on latter half of body-whorl. Surface lusterless, irregularly *wrinkle-striate and densely granulated*, the granules readily visible to the naked eye. Spire slender. Whorls 5, the first planorboid, sometimes wanting, the next minutely vertically striate; last whorl very rapidly enlarging, swollen.



Aperture very large, ovate, *purple-brown* with a pearly luster within; peristome brown, *well expanded throughout*. *Columella widened and white above*, brown and concave below, passing upward in a long, gently convex fold. Parietal callus thin, whitish.

Alt. 84, diam. 65; aperture, alt. 57, width 46 mill.

Alt. 80, diam. 58; aperture, alt. 52, width 40 mill.

*U. S. of Colombia, between La Plata and Tocaima* (Gibbon); *between Guaduas and Villeta* (Bland); *Quenden Mts.* (Pfr.).

*Bulimus gibbonius* LEA, Descr. New Freshwater and Land Shells, Trans. Amer. Philos. Soc. vi, p. 85, pl. 23, f. 99 (1836); Obs. Genus Unio, etc., ii, p. 85, pl. 23, f. 99.—PFR., Monogr., ii, p. 51.—REEVE, C. Icon., pl. 32, f. 196.—BLAND, in Ad., Contr. to Conch., No. 11, p. 229.

Differs radically from *B. castaneus* in sculpture; from *B. jimin-ezi* in form of the columella, and from *B. coloratus* var. *ampullaroides* in the slenderer spire, widened, white columella, etc.

P. EPISCOPALIS Pfeiffer. *Unfigured*.

Shell narrowly umbilicated, ovate-conic, thin, longitudinally subrugose-striate and minutely granulated, sometimes with transverse grooves. Olivaceous-tawny, with irregularly scattered reddish spots. Spire conic, rather acute. Whorls  $4\frac{1}{2}$ , the upper slightly convex, the last about two-thirds the shell's length, obliquely descending, arcuately subascending at aperture, the base slightly attenuated. Columella lightly, compressedly folded. Aperture angulate-oval, lilac colored within; peristome purple, expanded and narrowly revolute, the columellar margin subappressed.

Alt. 58, diam. 27 mill.; aperture 38 mill. long, inside 19 wide. (Pfr.).

*Bogota* (Cuming coll.).

*B. episcopalis* PFR., P. Z. S., 1855, p. 115; Monogr., iv, p. 379.

A smaller variety is mentioned by Pfeiffer, alt. 47, diam. 22 mill.

Form like *B. taylorianus* Rve., but the rest of the characters approaching *B. pulicarius* Rve.; differing in size, formation of the columellar fold and the widely expanded peristome.

P. CORTICOSUS Sowerby. Pl. 3, fig. 8.

Shell narrowly perforate, ovate-conic, solid, most minutely granulated throughout; dark brown, with obscure scattered dots and

flames of blackish; spire acutely conic. Whorls 5, lightly convex, last whorl about two-thirds the total length; columella with a stout oblique fold. Aperture oval, livid inside; peristome thickened, expanso-reflexed, the ends joined by a somewhat thick callus; columellar margin dilated, nearly closing the perforation. Alt. 58, diam. 30 mill.; aperture, alt. 26, width inside 14 mill. (*Sowb.*).

*Bogota* (coll. S. I. DaCosta).

*Bulimus (Eurytus) corticosus* SOWB., Proc. Malac. Soc. London, i, No. 5, p. 214, pl. 13, f. 2 (March, 1895).

Compared with *B. lamarkianus* Pfr., the spire is much more conical and the mouth smaller. The new species is further distinguished by its thickened columella fold. (*Sowb.*).

*P. CARDINALIS* Pfeiffer. Pl. 33, figs. 52, 53.

Shell subperforate, compressed-ovate, solid, having growth-striae, and very close longitudinal, spiral and oblique impressed lines. Olivaceous-chestnut, shining, with undulating reddish lines above, and sparse blackish spots. Spire inflated-conic, rather obtuse; whorls 4, convex, the last four-sevenths the length of shell, inflated, subcompressed at base. Columella nearly vertical, subplicate above. Aperture a little oblique, oval; peristome lilac, the margins joined by a moderately thick callus, right margin expanso-reflexed, columellar margin dilated.

Alt. 50, diam. 28; aperture measured inside, alt. 26, width 15 mill. (*Pfr.*).

*Napo* (Martinez), and *Quito, Ecuador* (Cuming coll.); *Nanegal* (Orton, Wolf); *Valley of Pilaton*, 500-1000 meters alt. (Boetzkas).

*B. cardinalis* PFR., P. Z. S., 1852, p. 58; Monogr., iii, p. 316; Conchyl. Cab., p. 113, pl. 35, f. 7, 8.—HIDALGO, Viaje al Pacifico, p. 92.—*Eurytus cardinalis* MILLER, Malak. Bl., xxv, p. 182.

According to Miller, this is one of the most abundant species of Ecuador. It is notable for the thickness of the shell, strongly thickened and recurved peristome, straight columella and heavy callus.

*P. TETENSII* Dunker. Pl. 33, figs. 50, 51.

Shell oblong-ovate, subglandiform, scarcely umbilicated, rather thin, reddish, partly somewhat whitish, with some scattered pale brown spots; covered with a shining corneous yellowish epidermis.



Whorls 5, longitudinally densely plicate and rugate, separated by a marked suture, the last whorl quite double the length of the spire; apex a little obtuse, brownish-rose. Aperture ovate; columella somewhat twisted; outer lip somewhat thickened within, a little reflexed, roseate. Length of largest specimen 50, diam. about 25; aperture, alt. 30, width 16 mill. (*Dkr.*).

*Sierra Nevada di Sta. Marta, U. S. of Colombia* (H. Tetens).

*B. tetensii* DKR., Nachr. D. M. Ges., vii, 1875, p. 29; Jahrb. D. M. Ges., ii, 1875, p. 221, pl. 6, f. 3, 4.

Of this species of the characteristically Columbian and Peruvian group *Eurytus*, two specimens were brought by Mr. H. Tetens of Altona. They were found in great numbers in an Indian village (Macotama) at an altitude of 10,000 feet. The Indians (of the Aruaco stock) used them for food, bringing them from higher up, 11–12,000 feet alt.

*P. PULICARIUS* Reeve. Pl. 7, figs. 1, 2, 3.

Shell umbilicate, ovate, rather thin; brown (or fleshy-corneous) with sparsely scattered oblique spots or short stripes of darker. Surface lightly wrinkled by growth-lines, decussated by few or many incised spirals, and more or less granulated irregularly. Spire conic, the apex obtuse. Whorls  $4\frac{1}{2}$ , convex, the last obliquely descending.

Aperture rounded-ovate; peristome reflexed and recurved, roseate with pale edge, rounded on the face. Columella dilated above, impressed at its junction with body above, having a short, weakly convex, oblique fold. Parietal callus thin and transparent.

Alt. 35, diam. 22; aperture, alt. 21 mill.

Alt. 30, diam. 17; aperture, alt. 16 mill.

*Bogota, U. S. of Colombia.*

*B. pulicarius* REEVE, Conch. Icon., vi, pl. 42, f. 267 (Oct., 1848). —PFR., Monogr., iii, p. 325; Conchyl. Cab., p. 186, pl. 54, f. 6, 7. —DESH. in Fér., Hist., p. 40, pl. 145, f. 16–18. —*B. glandiformis* PFR., Monogr., ii, p. 49, not of Lea.

*P. GLANDIFORMIS* Lea. Pl. 38, figs. 1, 2, 3, 4.

Shell imperforate, oval, rather thin. Dull reddish-chestnut, vermiculately mottled with whitish, under a transparent yellow cuticle, the spire paler; suture bordered below by a narrow dark reddish-brown band extending upward to the apex, and on the last

whorl interrupted by irregular or zigzag light streaks. Sculpture, a dense, fine malleation of the whole body-whorl, covered by a microscopic granulation, the granules tending toward arrangement along striæ in the direction of growth-lines (fig. 4); penultimate whorl somewhat less malleated, not granulate; first whorl with fine irregular oblique striæ; the whorls of spire plicate below sutures. Apex planorboid, a pit at the tip. Whorls  $3\frac{1}{4}$ , the earlier slightly convex, latter  $1\frac{1}{2}$  decidedly convex; last half of body-whorl rapidly and deeply descending.

Aperture about three-fifths the total alt., ovate-piriform, flesh-colored inside, with a sub-margin of brown within the lip, peristome expanded and narrowly reflexed, brown-tinted white, convex on the face; columella narrow, reflexed and adnate above, the inner edge whitish, extending upward in a rather long, feebly convex fold; parietal wall smoky-brown, covered by an almost imperceptible, transparent film. Alt. 31, greatest diameter 19, alt. of aperture 19 mill.

Between La Plata and Tocaima, U. S. of Colombia (J. H. Gibbon, M. D.).

*Bulimus glandiformis* LEA, Trans. Amer. Philos. Soc. (n. s.), vi, 1836, p. 83, pl. 23, f. 92 (June 15, 1838); Obs. Gen. Unio, ii, p. 83, pl. 23, f. 92.

Description and figures from Lea's type, no. 105045 of the Smithsonian Institution collection. There is some superficial resemblance to *P. pulicarius*, but that species has more whorls, a deeper suture and rounder mouth, is variegated with dark brown, and it lacks the conspicuous and characteristic malleation of *glandiformis*. The superficial dents in this species are arranged in obliquely descending series in some places, elsewhere are irregular; the mesh of wrinkles around the indentations is mainly light yellow, where the thin, glossy cuticle is retained; but on the body-whorl there are some oblique stripes of a darker chestnut, without buff net-work. *P. subglandiformis* Mouss. is a longer shell than this, but is apparently its nearest ally.

*P. MABILLEI* Crosse. Pl. 21, figs. 44, 45.

Shell slightly subrimate, ovate, thin, longitudinally rugose, closely granulate; brown under a thin, partly deciduous, buff epidermis, marked transversely with few and inconspicuous blackish spots. Spire conic, the apex moderately obtuse; whorls  $4\frac{1}{2}$ , slightly con-



vex, the embryonal  $1\frac{1}{2}$  smooth, brownish-purple, the last whorl slightly ascending at the insertion, subinflated, two-thirds the total length. Aperture suboval, brown and shining inside; peristome narrowly reflexed, white; columellar margin complanate, twisted inward above, receding at base. Alt. 24, diam. 16; aperture  $15\frac{1}{2}$  mill. long,  $9\frac{1}{2}$  wide. (*Crosse*).

*Mountains of Colombia.*

*B. mabillei* CR., Journ. de Conchyl., xv, 1867, p. 197, pl. 6, f. 4.—PFR., Monogr., vi, p. 46.

Resembles *B. pulicarius* Rve., but with different epidermis, smaller, less inflated, the columellar margin more twisted and the umbilical chink narrower.

P. SUBGLANDIFORMIS Mousson. Pl. 4, figs. 6, 7.

Shell subimperforate, elongate-ovate, moderately striated, densely and minutely evenly granulated. Tawny buff, obscurely maculated, at the suture articulated with brown and yellow. Spire convex-conic, somewhat exserted, the apex rather obtuse, corneous-brown; suture regular, subimpressed. Whorls 5, flat-convex, the first strongly striated, the following granulated throughout, the maculations giving a crenulated appearance to the suture; last whorl visibly descending, a little longer than spire, long-ovate, slender, somewhat narrowed below.

Aperture three-fifths the length, subvertical ( $30^\circ$  with axis), oval, narrowed above, broadly effuse at base, whitish inside; peristome expanded and narrowly reflexed, obtuse, not thickened, the right margin regularly curved, columellar margin passing into the oblique and twisted columella, reflexed and adnate above. Alt. 34, diam. 19 mill. (*Mouss.*). *Colombia.*

*B. subglandiformis* MOUSS., Malak. Bl., xxi, 1873, p. 6.—PFR., Novit. Conch., iv, p. 127, pl. 129, f. 1, 2; Monogr., viii, p. 605.—? *B. glandiformis* REEVE, Conch. Icon. pl. 42, f. 266.—PFR., Monogr., iii, p. 325; iv, p. 383; vi, p. 29.—Not *B. glandiformis* Lea.

This species is identified by Mousson with *B. glandiformis* of Reeve, not Lea; whether correctly or not we do not know. It seems, however, to be a well marked species, more elongated than its allies.

P. CORYDON Crosse. Pl. 33, fig. 49.

Shell imperforate, ovate-acuminate, moderately thick, solid, nearly smooth. Pale whitish-buff, with somewhat interrupted, irregu-

lar chestnut, longitudinal streaks. Spire moderately lengthened, apex rather obtuse; suture impressed. Whorls 5, a little convex, the first two shining, corneous-white, the last whorl slightly descending, a little longer than the spire, somewhat inflated. Aperture oblong-ovate; peristome somewhat thickened, white, the ends joined by a rather thick blue-gray callus; columellar margin adnate, basal and outer margins dilated, reflexed throughout. Alt. 32, diam.  $23\frac{1}{2}$  mill. (*Crosse*).

Quito, Ecuador (Paz).

*B. corydon* CR., Journ. de Conchyl., xvii, 1869, p. 185; xviii, 1870, p. 104, pl. 6, f. 6.

P. PHÆBUS Pfeiffer. *Unfigured*.

Shell imperforate, ovate-fusiform, thin, lightly striatulate, little shining; pale buff, irregularly painted with streaks and spots of brown. Spire conic, rather acute. Whorls  $5\frac{1}{2}$ , slightly convex, the last not descending, a little longer than the spire, more swollen, very obsoletely angulated in the middle. Columella compressed, lightly arcuate. Aperture little oblique, angulate-elliptical; peristome roseate, margins joined by a brownish callus, the right margin expanded, basal margin subproduced, columellar margin narrow. Alt. 31, diam. 15 mill.; aperture, alt. 16, width 10 mill. (*Pfr.*).

Ecuador (Mus. Cuming).

*B. phæbus* PFR., P. Z. S., 1862, p. 274; Monogr., vi, p. 9.

P. TAQUINENSIS Pfeiffer. *Unfigured*.

Shell subperforate, ovate-oblong, rather solid, longitudinally minutely striated and malleated; painted with indistinct oblique reddish streaks under a brownish-olive cuticle. Spire convex-conic, rather obtuse; whorls 4, moderately convex, the last a little longer than the spire, rounded at base. Columella lightly folded. Aperture subvertical, acuminate-oval, pearly inside; peristome somewhat thickened, flesh-colored; right margin revolute, columellar margin subdilated, horizontally spread and reflexed. Length 40, diam. 18 mill.; aperture with peristome 20 mill. long, width inside 11 mill. (*Pfr.*).

Taquina, Sierra Nevada di Sta. Marta, Colombia, 9000 ft. alt. (Mus. Cuming).

*B. taquinensis* PFR., P. Z. S., 1854, p. 290; Monogr., iv, p. 380.





*Group of P. succinoides.*

Ovate, imperforate, with large aperture; surface with creamy oblique or zigzag epidermal stripes.

*P. CATHCARTIÆ* Reeve. Pl. 4, figs. 1, 2; pl. 3, fig. 9.

Shell ovate, ventricose, spire short; whorls 5, obliquely very finely striated, last whorl very large. Aperture wide open; lip somewhat broadly reflected. Whitish or purplish-chestnut, covered with a yellowish-olive epidermis, and a second silken one which is more or less beautifully and variously configured; interior purple-chestnut, lip pink. (Reeve).

*Province of Merida, Colombia* (Linden).

*B. cathcartiæ* REEVE, Conch. Icon., pl. 42, fig. 265 (Oct., 1848).

I do not know upon what grounds Pfeiffer unites this with *B. pintadinus* Orb., for it seems to be an entirely different species; the figure 265c of Reeve's plate, however, offers some approach to *pintadinus* (see pl. 36, figs. 84, 85).

*P. VICTOR* Pfeiffer. Pl. 33, figs. 47, 48.

Shell imperforate, fusiform-ovate, rather solid, lightly striate, not shining. Painted with bands of yellowish-white, tessellated with reddish, and wider bands of greenish-brown streaked with whitish. Spire conic, the apex rather obtuse. Whorls 5, the upper but little convex, the last whorl three-fifths the shell's length, more convex, attenuated at base. Columella lightly arcuate, white. Aperture oblique, oblong-oval, pearly within; peristome red, thickened, narrowly reflexed, the ends connected by a deep violet callus. Alt. 65, diam. 29; aperture 40 mill. long, 20 wide. (Pfr.).

*Province Antioquia, Colombia* (Schlim).

*B. victor* PFR., P. Z. S., 1853, p. 128; Monogr., iv, p. 368; Novit. Conch. ii, p. 169, pl. 46, f. 1, 2.

*P. JUCUNDUS* Pfeiffer. Pl. 34, figs. 54, 55.

Shell subimate, ovate-conic, thin, plicatulate and granulate all over, diaphanous, little shining. Tawny, streaked with darker, painted with alternate chestnut and buff spots at the suture. Spire conic, rather obtuse. Whorls  $4\frac{1}{2}$ , slightly convex, the last descending, slightly longer than spire, rounded at base. Columella whitish, with a compressed twisted fold. Aperture slightly oblique, oval, flesh-colored within, shining; peristome narrowly expanded, obtuse, pale rose; columellar margin somewhat dilated above, and appressed.

Alt. 31, diam. 15 mill.; aperture, alt. 18, width in the middle 9 mill. (Pfr.).

*Province Antioquia, Colombia* (Schlim).

*B. jucundus* PFR., P. Z. S., 1854, p. 290; Monogr., iv, p. 364; Novit. Conch., i, p. 30, pl. 8, f. 8, 9.

*P. QUADRICOLOR* Pfeiffer. Pl. 34, figs. 56, 57.

Shell imperforate *Succinea*-shaped, thin, striatulate; buff with close, oblique, chestnut "lightning-streaks," and some wider straw-colored streaks, serrate on front edge, and evanescent below the middle. Spire conic, rather obtuse. Whorls 4, nearly flat, the last a little convex, about two-thirds the entire length. Columella thread-like; peristome very narrowly expanded throughout, roseate, its ends joined by a very thin callus. Alt.  $30\frac{1}{2}$ , diam. 14 mill.; aperture, alt. 21, diam. 11 mill. (Pfr.)

*Chachopo, Prov. Merida, Colombia* (Funck).

*B. quadricolor* PFR., P. Z. S., 1847, p. 229; Monogr. ii, p. 18.—PHIL., Abbild. iii, p. 20, pl. 8, f. 4.—REEVE, Conch. Icon., pl. 42, f. 263.

Differs from *B. veranyi* in the bold, zig-zag brown streaks.

*P. VERANYI* Pfeiffer. Pl. 34, figs. 58, 59, 60, 61, 62.

Shell ovate, subperforate, rather solid but thin; "tawny, with scattered chestnut dots and ornamented with separated buff or white zig-zag streaks," or buff-brownish with indistinct scattered transverse brown dots, and longitudinal buff zig-zag streaks interrupted into a net-work of >-shaped markings. Surface delicately but densely granulose throughout, and with faint, spaced spiral cords. Spire short, conic. Whorls  $4\frac{1}{2}$ , the last descending in front.

Aperture large, ovate; peristome white, narrowly expanded above, broadly so toward the base; columella white, narrow and arcuate below, reflexed and folded above. Parietal callus a mere transparent film.

Alt. 27, diam. 17; alt. of aperture, 17 mill.

Alt. 33, diam. 15; alt. of aperture, 20 mill.

*Chachopo, Prov. Merida, Colombia* (Funck).

*B. veranyi* PFR., P. Z. S., 1847, p. 230; Monogr. ii, p. 49.—PHIL., Abbild., iii, p. 20, pl. 8, f. 5, 9.—REEVE, Conch. Icon., pl. 42, f. 262.

It is more conoidal, less swollen above than *P. succinoides*, the aperture is smaller, parietal wall light colored. The papery light markings are sometimes nearly absent.



Var. *SCYTODES* Pfeiffer. Pl. 34, figs. 63, 64.

Shell imperforate, ovate-conic, thin, remotely striate, minutely granulate all over, the granules not regularly arranged, hardly shining; brown, with irregularly scattered reddish and larger blackish spots, and painted with angular, flexuous, longitudinal buff lines, often in pairs or confluent. Spire short, convex-conic, rather obtuse. Whorls 4, slightly convex, the last large, four-sevenths the entire alt., deflexed in front, rounded at base. Columella narrow, entering, lightly arcuate. Aperture little oblique, oval, concolored within, shining; peristome simple, thin, reddish, narrowly reflexed throughout. Alt. 35, diam.  $17\frac{1}{2}$ ; aperture, alt. 21, width 12 mill. (*Pfr.*)

*Andes of Colombia* (Cuming coll.).

*B. scytodes* PFR., P. Z. S., 1851, p. 256; Conchyl. Cab., p. 93, pl. 31, f. 17, 18; Monogr. iii, 302.

I am unable to find characters in this separating it from *P. veranyi*.

*P. SUCCINOIDES* Petit. Pl. 34, figs. 65, 66.

Shell succinea-shaped, ovate, imperforate, thin. *Yellow, with a dark chestnut sutural band, and more or less variegated with irregular, creamy oblique stripes; the parietal wall dark chestnut.* Surface lusterless, with irregular wrinkles in the direction of the growth-striae, and *densely, rather coarsely granulated throughout*, the granules irregular in arrangement. *Spire very short.* Whorls  $3\frac{1}{2}$  to 4, *the last very large.*

*Aperture very large*, about four-fifths the shell's length or somewhat less, ovate, flesh-tinted inside and often showing the external stripes; peristome *very narrowly* reflexed throughout, white; columella long, arcuate, white, dilated and adnate above.

Alt. 31, diam. 19; alt. of aperture, 22 mill.

Alt. 49, diam. 26; alt. of aperture, 38 mill.

*Santa F  de Bogota; Boca del Monte, Plain of Bogota (Bld.); Merida, Colombia.*

*B. succinoides* PET., Revue Zool., 1840, p. 75; Mag. de Zool., 1841, pl. 31.—PFR., Monogr., ii, p. 18.—REEVE, Conch. Icon., pl. 42, f. 264.—DESH. in F r. Hist., p. 46, pl. 145, f. 19–21.—MOUSSON, Malak. Bl. xxi, 1873, p. 7.—DOHRN, Jahrb. D. Malak. Ges. ii, 1875, p. 301.—*Bulinus succineoides* MART., Die Hel., p. 195.—*Succinea bulimoides* PFR., Symbol  ad Hist. Hel., ii, p. 131.—*Bulinus lati-*

*labris* PFR., P. Z. S., 1855, p. 7; Novit. Conch., i, p. 36, pl. 10, f. 1, 2; Monogr., iv, p. 364.

A remarkable and well-named species, differing from *P. veranyi* and *scytodes* in the larger body whorl, black-brown parietal wall, etc. The specimens before me support Dohrn's statement that *B. latilabris* (pl. 34, figs. 67, 68) is a synonym.

*P. CALLIOSTOMA* Dohrn. Pl. 34, figs. 69, 70.

Shell Succinea-like, imperforate, thin, pellucid; corneous-yellow, painted with irregular streaks and spots of whitish, and banded with brown at the suture. Spire conic, rather acute; suture distinct. Whorls 4, rapidly enlarging, the upper striated, the last whorl striated and densely granulated, very large, the base dilated, rounded, deeply descending in front. Aperture ample, acuminate-oval; peristome thin, violaceous-rose, expanded and reflexed throughout, the margins joined by a wide, thin, brown-violet callus; columellar margin arcuately ascending. Columella open as far as apex (seen from below). Length 29, diam. 15 mill.; aperture, length 22, width 14 mill. (*Dohrn*).

*Province Antioquia, U. S. of Colombia.*

*Bulimus (Eurytus) calliostoma* DOHRN, Jahrb. D. M. Ges., ix, 1882, p. 103, pl. 3, f. 1, 2.

Nearest allied to *B. succinoides* from the same region, but distinguished by the red lip. All other species of this group have the spire higher and mouth smaller. (*D.*).

*Group of P. castaneus.*

Ovate, rather obese, the peristome narrowly expanded.

*P. CASTANEUS* Pfeiffer. Pl. 35, fig. 73.

Shell narrowly perforate, ovate, solid; unicolorous chestnut. Surface showing distinct growth-wrinkles cut by numerous more spaced, shallow and rather wide spiral sulci, on the upper part of body-whorl, cutting the wrinkles into narrow spiral girdles of long, vertical granules; on the middle and lower part of body-whorl not granulate, obscurely latticed and malleated by oblique short impressions. Spire small, conic; whorls  $4\frac{1}{2}$ , the first planorboid with sunken tip, white above, the next most minutely and densely granular; last whorl rapidly enlarging.

Aperture large, ovate, brown inside; peristome narrow, brown, the outer lip not thickened, hardly noticeably expanded; columella



narrowly reflexed, *gently concave*, but little wider above, without noticeable fold, and *together with the moderately strong parietal callus, brown throughout*. Alt. 66, diam. 45; aperture, alt. 44, width 30 mill.

*U. S. of Colombia, Vegas of the River Quenden (Pfr.); near Fresno and Santa Ana (Bld.); Upper Magdalena Valley, common (Dohrn).*

*B. castaneus* PFR., P. Z. S., 1845, p. 68; Monogr., ii, p. 52.—Rve., C. Icon., pl. 32, f. 197.—BLAND, in C. B. Ad. Contrib. to Conch., No. 11, p. 229.—DOHRN, Jahrb. D. M. Ges., ii, 1875, p. 301.—MOUSSON, Malak. Bl., xxi, p. 4.—DESH. in Fér., Hist., p. 53, pl. 130, f. 1, 2.

Well distinguished from other species of this group by the non-granulate surface.

*P. ELAEODES* Pfeiffer. Pl. 35, figs. 71, 72.

Shell imperforate, ovate, rather thin, rugose-striate, transversely submalleated, diaphanous, shining; chestnut-olivaceous. Spire conoidal, the apex obtuse. Whorls 4, slightly convex, the last about four-sevenths the total length, descending in front, rather rounded beneath. Columella entering, somewhat twisted, roseate; aperture subvertical, oval, pearly within; peristome roseate, somewhat thickened, narrowly reflexed, the ends joined by a callus spreading over the umbilical region. Alt. 36, diam. 18 mill.; aperture measured inside, alt. 19, width 11 mill. (Pfr.).

*Andes of Columbia (Cuming coll.); Lower Magdalena Valley (Wallis).*

*B. elaeodes* PFR., P. Z. S., 1851, p. 256; Monogr., iii, p. 305; Conchylien Cabinet, p. 87, pl. 30, f. 23, 24.—MOUSSON, Malak. Bl., xvi, 1869, p. 173.

Distinguished, says Mousson, by its very strong, irregular spiral grooving. Upper whorls lighter and showing zig-zag streaks.

*P. JIMENEZI* Hidalgo. Pl. 35, figs. 69, 70.

Shell subimperforate, ovate-acuminate, thin, subpellucid, not shining. Surface striatulate and under a lens very minutely granulated; whitish, more or less copiously besprinkled with small spots and dots of chestnut, sparse or confluent, and partly obliquely elongated, covered with an olivaceous cuticle. Spire short, conic, the apex rather acute and chestnut-brown; suture simple; whorls 5, rather flattened, rapidly enlarging, the last large, ventricose, ob-

liquely descending. Columella oblique, narrow, twisting inward, its spiral ascent to the apex being visible from below; aperture ample, ovate-acuminate, shining and pale blue tinted within, about five-sevenths the shell's length. Peristome simple, narrowly expanded, hardly reflexed, fleshy-brown; the margins joined by a very thin callus; right margin strongly arched, columellar margin narrow, subreflexed. Alt. 75, diam. 47 mill. (*Hid.*).

*San José, Ecuador* (Isern).

*Bulimus gibbonius* *HID.*, Journ. de Conchyl., xviii, 1870, p. 54; *Moluscos del Viaje al Pacifico*, pl. 5, f. 2, 3.—*B. jimenezi* *HID.*, *t. c.* p. 93.

Distinguished readily from *B. gibbonius*, *coloratus*, *ampullaroides*, etc., by the narrow columella, the spiral trend of which to the apex may be seen from the base.

P. TRICOLOR Pfeiffer. Pl. 35, figs. 74, 75.

Shell subperforate, ovate, thin, striate and minutely granulate; olive-brown, with oblique, interrupted lighting stripes of deep chestnut. Spire ventricose-conic, the apex red and rather acute; suture denticulate-marginate. Whorls 4, the upper 2 rather flat, the last ventricose, very obliquely descending at the latter part, attenuated at base. Columella simple, arcuate; aperture small, slightly longer than spire; oblong-oval; peristome reddish-fleshy, somewhat thickened, slightly expanded, the columellar margin dilated and reflexed above. Alt. 42, diam. 21 mill.; aperture 22 mill. long, 13 wide. (*Pfr.*).

*Guala, Ecuador* (Bourcier).

*B. tricolor* *PFR.*, P. Z. S., 1852, p. 154; Monogr., iii, p. 325; Conchyl. Cab., p. 95, pl. 32, f. 17, 18.

The following is evidently a variety of this, as Hidalgo himself suspected.

Var. SEMIPICTUS Hidalgo. Pl. 5, figs. 24, 25; pl. 8, fig. 41.

Shell subimperforate, ovate, thin, subpellucid, but little shining, rather smooth. Whitish, the earlier whorls with narrow oblique "lightning" stripes, the last with sparse dots of the same color, vanishing toward the aperture; covered with an olivaceous cuticle. Spire conic, apex rather obtuse, purple-brown; suture simple, sometimes slightly crenulated. Whorls 4, subplanate, rapidly increasing, the earlier 2 seen to be minutely wrinkled under a lens, the last



somewhat inflated on the back, flattened toward the aperture, deeply descending in front, subdilated beneath.

Columella narrow, oblique, twisted inward, visible inside from the base as far as the apex. Aperture ovate-acute, subdilated below, three-fifths the length of the shell, within concolored; peristome simple, sometimes somewhat thickened, narrowly expanso-reflexed throughout, purple-brown; the terminations joined by a very thin callus; right margin well arched, columella slightly dilated above, adnate. Alt. 38, diam. 23 mill.

*Baeza, Ecuador (Martinez).*

*B. semipictus* HID., Journ. de Conch., xvii, 1869, p. 188; xviii, 1870, pl. 6, f. 7; Moll. Viaje al Pacif., p. 95, pl. 6, f. 8, 9.

In the majority of its characters, according to Hidalgo, this form is like *B. tricolor* Pfr., but it differs in the more obtuse spire, larger aperture, diverse direction of the columella, fewer color-lines and lack of granulation on the last whorl, though with a high power lens granulation is visible on the second whorl.

*P. ARISTÆUS* CROSSE. Pl. 4, fig. 4.

Shell nearly covered rimate, irregularly ventricose-oval, longitudinally wrinkle-striate; olive-chestnut, with sparse zig-zag streaks and spots of blackish-brown, nearly disappearing on the last whorl. Spire rather short, the apex obtuse; suture well marked. Whorls  $4\frac{1}{2}$ , somewhat convex, the nepionic  $1\frac{1}{2}$  smooth and polished, violet-purple; penultimate whorl strongly convex; last whorl deeply obliquely descending, carried forward, large, inflated, much longer than the spire.

Columella perceptibly receding, white within; aperture oval, subpiriform, moderately large, soiled white within; peristome pale chestnut whitish, somewhat thickened, narrowly reflexed, the margins somewhat converging, joined by a very thin callus; columellar margin flat, slightly dilated. Alt. 48, diam. 27 mill.; aperture (with peristome) alt. 27, width 18 mill. (*Crosse*).

*Quito, Ecuador (Paz).*

*B. aristæus* CROSSE, Journ. de Conch., xvii, 1869, p. 185; 1870, p. 105, pl. 6, f. 5.

*Group of P. taylorianus.*

Ovate, imperforate, the lip and columella narrow, not expanded; suture abruptly descending in front, the whorl flattened there.

a. Surface spirally striated.

b. Light, with brown dots and spots, spire rather long,  
*piperitus.*

bb. Dark chestnut, solid, spire short, *superstriatus.*

aa. Surface irregularly granulate.

b. Yellowish with brown dots, *pseudopiperatus.*

bb. Chestnut-brown, markings indistinct, *taylorianus.*

P. PIPERITUS Sowerby. Pl. 36, fig. 77.

Shell imperforate, ovate-acuminate, thin but rather solid; color a light brown tint, irregularly and finely speckled and spotted with chestnut throughout. Surface lusterless, smoothish, under a lens showing close, irregular growth-wrinkles cut by numerous more spaced spirals. Spire regularly conic. Whorls 5, the last rather compressed above, sack-like below, suddenly deflexed and flattened behind posterior angle of aperture. Aperture ovate, bluish and with some spots within; peristome white, a trifle thickened, not noticeably expanded; columella concave, narrow, slightly widening at insertion where it is reflexed and adnate; parietal callus thin and transparent. Alt. 44, diam. 25; aperture, alt. 24 mill.

*Huallaga, Peru.*

*Bulinus piperitus* SOWB., Conch. Illustr., f. 93.—*Bulinus piperitus* REEVE, Conch. Syst., ii, pl. 174, f. 93; Conch. Icon., pl. 16, f. 96.—PFR., Monogr., ii, p. 17.

P. PSEUDOPIPERATUS Moricand. Pl. 35, fig. 76.

Shell ovate, imperforate, solid, inflated; covered with a yellowish epidermis, with scattered brown dots. Spire rather short, acuminate; suture impressed. Whorls 5 to  $5\frac{1}{2}$ , rapidly enlarging, convex, the last large, deeply descending,  $\frac{3}{4}$  the length of shell, rugose-granulate and irregularly striated. Aperture ample, oblong-oval; lip simple, not reflexed, white; columella reflexed, straight, calloused; inside shining, with a pearly sheen. (*Moric.*) Alt. 60, diam. 30 mill.

*Moyobamba, Peru.*

*B. pseudopiperatus* MORIC., Rev. et Mag. de Zool. (2) x, 1858, p. 451, pl. 14, f. 2 (Oct., 1858).—PFR., Monogr., vi, p. 88.

Moricand's figure measures alt. 60, diam. 31 mill., differing considerably from the dimensions in his text, which are, alt. 40, diam. 30 mill., probably by typographical error.



This *Bulimus*, of a soiled grayish-white, spotted and dotted with small brown spots, resembles *B. piperatus* Sow., but is larger, much thicker, and the last whorl is proportionally more lengthened and swollen. Moreover the structure is very different, for there are only longitudinal striæ, not cut transversely by finer ones; the granulation is coarser. The columellar margin is noticeably reflexed, applied to the whorl, and united to the right margin by a more or less thick layer of white enamel. The interior is bluish nacreous. (*Moric.*)

*P. TAYLORIANUS* Reeve. Pl. 36, figs. 78, 79.

Shell imperforate, ovate-conic, rather thin, irregularly striated and minutely granulated throughout; lusterless; chestnut-brown, with scattered dots of darker, and on the spire some zig-zag blackish lines. Spire slender, conic, apex rather acute; whorls  $4\frac{1}{2}$ -5, those of spire nearly flat; suture impressed, becoming deep and slightly crenulated around last whorl, which is wrinkled below it. Last whorl large, swollen, very abruptly and deeply descending in front.

Aperture ovate, fleshy-brown and glossy within; peristome simple, obtuse, flesh-colored; columella very narrow, gently arcuate, flesh-colored, slightly dilated and appressed above; parietal callus thin, fleshy, not projecting or spreading outward beyond the level of the lip.

Alt. 53. diam. 30; aperture, alt. 32 mill. (specimen).

Alt. 66, diam. 30; aperture, alt. 39 mill. (Pfr.).

Around Quito, Ecuador; Chimborazo (Bourcier); Los Puentes, prov. Pinchincha (Cousin).

*B. taylorianus* RVE., Conch. Icon., pl. 81, f. 602.—PFR., Monogr., iii, p. 381; Conchyl. Cab., p. 95, pl. 32, f. 1, 2.—*Eurytus taylorioides* MILLER, Malak. Bl. xxv, p. 180; and (n. F.) i, pl. 7, f. 1, (var. *minor*).

The sparsely scattered dark markings are not conspicuous on account of the darkness of the ground-color; and there is sometimes, perhaps always, a peppering of minute golden points on the body-whorl. The spire is quite slender for so inflated a body-whorl, and the abrupt descent of the last whorl in front is very characteristic.

I can see no reason for the existence of Miller's *taylorioides*, founded on Pfeiffer's figures.

*P. SUPERSTRIATUS* Sowerby. Pl. 36, fig. 80.

Shell imperforate, ovate-conic, rather solid, shining, longitudinally rugate, spirally striate; chestnut, obscurely flammulate and maculate with blackish-brown. Spire conic, apex rather acute; whorls 5, slightly convex, crenulated at the suture, the last exceeding the spire, sculptured with numerous incised spiral striæ, disappearing toward the base. Aperture oval, bluish-purple inside; peristome scarcely thickened, buff. Alt. 54, diam. 29 mill. (*Sowb.*).

*Yquitos, Peru.*

*B. superstriatus* Sowb., P. Z. S., 1889, p. 578, pl. 56, f. 9.

Resembling *B. taylorianus* Reeve, but spirally sculptured, thus presenting a character quite unusual in the genus, and unknown among the species of this group. (*Sowb.*).

Var. *PRODEFLEXUS* Pilsbry. Pl. 36, fig. 81.

Shell imperforate, ovate-conic, *solid*. Yellowish-chestnut, sprinkled with golden dots and maculæ, showing a few longitudinal dark streaks and scattered spots; the earlier whorls purplish-brown. Surface with growth wrinkles, irregularly cut into narrow vertical granules by *more distant spiral incised lines*, subobsolete below. Spire stout, conical; apex obtuse. Whorls  $4\frac{1}{2}$ , gently convex, the last transversely dilated, compressed around the upper part, *deeply deflexed in front*, slightly gibbous around columella.

Aperture over half the shell's length, somewhat oblique, purplish inside, ovate-angular; peristome blunt, not expanded, its edge yellowish, broadly bordered inside with blue-white; columellar margin *abruptly arcuate below, straightened above, oblique, passing into parietal wall without an angle*; parietal callus narrow, extending low on columella. Alt. 52, diam. 30 mill.; alt. of aperture 28 mill.

*Balsas, valley of Marañon R., Peru* (H. W. Webb).

Resembles Sowerby's *B. superstriatus* (which I know from his description and figure only) in sculpture, but differs from his figure in the stouter spire, and very different form of the columella.

*P. AUREONITENS* Miller. Pl. 38, fig. 5.

Shell imperforate, ovate-conic, compressed, rather thin, smooth, most minutely, closely granulated, partly (especially anteriorly on penultimate whorl) spirally lineate; slightly golden-shining, rufous, diaphanous; ornamented with oblique darker streaks on penultimate



whorl, and scattered darker spots on the last whorl. Spire conic, the apex obtuse. Whorls  $4\frac{1}{2}$ , rather flat, at the slightly impressed suture distinctly striate or costulate; first whorl granulate, the following striate or decussated, *the last whorl nearly smooth*, three-fifths the alt. of shell, inflated in front, suddenly and arcuately deeply descending.

Columella twisted, passing arcuately into peristome. Aperture oblique, oval, the peristome simple, above a little reflexed, the columellar margin narrowly reflexed and adnate, brown-flesh color; terminations joined by a thin, shining, white-edged callus. Alt. 53, diam. 25 mill.; aperture, alt. 32, width 21 mill. (Miller).

*Pilaton Valley, Ecuador* (P. Boetzkcs).

*Eurytus aureonitens* MILLER, Malak. Bl., xxv, p. 181; and (n. F.) i, pl. 6, f. 2.

This species is evidently allied to the two preceding, but differs in the smooth body-whorl. Miller says: The vertical distribution of this species seems to be restricted. It lives on leaves and is rather plentiful. The columella is so strongly curved that it coils around a central hole, through which one can see to the apex.

*Group of P. floccosus.*

Lengthened, imperforate, the peristome narrow.

*P. FLOCCOSUS* Spix. Pl. 37, figs. 86, 87, 88.

Shell imperforate, much elongated, rather thin, but solid, hardly shining. Dull purplish-brown, with *scattered spots* (and usually some streaks) of dark purple-chestnut, *each edged on the left by a transverse, shadow-like buff patch*; the spire clear light brown. Surface *closely and coarsely plicate-striate, and minutely, very densely, irregularly granulate*, the granulation disappearing on spire; nepionic whorls with a thimble-like punctulation. Spire conic, apex obliquely obtuse, the tip white. Whorls 5, feebly convex, the last descending and flattened in front.

Aperture long-ovate, within purple-fleshy or purple-brown, maculated with darker and cream; peristome simple above, gently expanded toward the base; columella simple and very narrow below, dilated and appressed above; parietal callus a mere transparent varnish. Alt. 62, diam. 25 mill.; aperture, alt. 38 mill.

*Napo, Ecuador* (Martenez); *Banks of the Amazon* (Spix).

*Achatina floccosa* SPIX, Test. Bras. pl. 9, f. 3, 4.—*Bulimus floccosus* WAGNER, t. c., p. 10 (1827).—DESH., in Lam. An. s. Vert., viii, p. 241.—PFR., Monogr., iii, p. 302, iv, p. 363.—HIDALGO, Mol. Viaje al Pacif., p. 127, pl. 7, f. 1-4.

More strongly striate than its allies. Hidalgo unites *B. pintadinus* Orb. to *floccosus*, considering it the adult form. The specimens before me are apparently adult, and are of the form shown in figs. 86, 88.

*P. PINTADINUS* d'Orbigny. Pl. 36, figs. 84, 85.

Shell oblong, ventricose, thin, substriate, brownish-violaceous, ornamented with reddish-brown and whitish spots. Spire conic, apex acuminate, obtuse. Whorls 5, the last oblique, large. Aperture oval, brown-violaceous; columella thick; lip somewhat thick, sub-reflexed. Length 60, diam. 30 mill. (Orb.).

*Humid and luxuriant forest country of the Yuracarés, at the foot of the eastern cordillera of Bolivia* (Orb.).

*Helix pentadina* ORB., Mag. de Zool., 1835, Cl. V, No. 61, p. 8; Voy. dans l'Amér. Mérid., pl. 29, f. 11, 12; *Bulimus pintadinus* ORB., t. c., p. 296.—PFR., Monogr., ii, p. 17; iii, 314; iv, p. 377; vi, p. 22.

Described from one dead specimen, deposited in the collection of the Museum of Natural History of Paris. The colors are somewhat faded, but it seems to be of a brown-violet tint, darker on the last whorl, which is ornamented with a few small transverse spots of dark brown violet, each with a transverse white spot on its left side, so that the dark spots seem like the shadows of the light ones. It is shorter and more ventricose than *B. floccosus*, and, judging from Orbigny's figures, there seems to be an umbilical chink behind the columellar lip.

*P. ONCA* d'Orbigny. Pl. 37, figs. 89, 90, 91.

Shell imperforate, elongated, rather thin, striatulate, diaphanous; tawny, with irregularly scattered chestnut spots. Spire conic, the apex obtuse. Whorls 5, the last hardly longer than spire. Columella scarcely folded, obliquely receding, roseate. Aperture oblong-oval, flesh-colored inside; peristome narrowly expanded, its ends joined by a thin rosy callus. Alt. 58, diam. 22 mill.; aperture 31 mill. long, 13 wide. (Pfr.).

*Tutulima, northeastern part of eastern cordillera of Bolivia in deep humid ravines* (Orb.).



*Helix onca* ORB., Mag. de Zool., 1835, p. 8; Voy. dans l'Amér. Mérid., pl. 30, f. 1, 2.—*B. onca* ORB., t. c., p. 295.—REEVE, Conch. Syst., ii, pl. 173, f. 3; Conch. Icon., pl. 18, f. 108.—PFR., Monogr., ii, p. 17.—*Bulinus onca* SOWB., Conch. Illustr., f. 80.—*Placostylus onca* BECK, Index, p. 58.—*Bulimus onca* ALB., Die Hel., (2) p. 195.

Not deeply striate as *B. floccosus* is, but resembling that species in form.

P. LYNICULUS Deville & Hupé. Pl. 36, figs. 82, 83.

Shell imperforate, ovate-oblong, thin, subpellucid, but little shining, obsoletely subdecussated. Whitish-rose, irregularly marked with longitudinal dots and lines of chestnut, covered with a thin tawny cuticle. Spire conoid, the apex somewhat obtuse, roseate; suture simple. Whorls  $5\frac{1}{2}$ , slightly convex, rather rapidly increasing, the last somewhat ventricose, subdeflexed in front. Columella roseate, oblique, narrow, and twisted, its spiral turns visible inside to the apex from the base. Aperture oval, acuminate above, within colored like the outside, rose-tinted, three-fifths the shell's length; peristome simple, rose-tinted, slightly expanso-reflexed, the margins joined by a very thin callus; right margin regularly arcuate, columellar margin a little dilated, adnate. Alt. 50, diam. 25 mill. (*Hidalgo*).

Mission of Sarayacu, on the river Ucayali, Peru (Castelnau); Napo, Ecuador (Martinez).

*B. lynciculus* DEVILLE & HUPE, Revue Zoologique, 1850, p. 640, pl. 15, f. 1.—HUPE, Anim. nouv. ou rares rec. pendant l'Exped. dans les parties centr. de l'Amér. du Sud., sous la direction du Comte F. de Castelnau, Moll., p. 40, pl. 5, f. 3, 3a.—HIDALGO, Mol. Viaje al Pacif., p. 94.—PFR., Monogr., iii, p. 381; iv, p. 449; vi, p. 88; viii, p. 34.

Compared by Hupé with *B. onca*, a longer, thinner shell, and *B. taylorianus*, from which the simple suture and coloring separate it. Hidalgo says that the longitudinal lines are more irregular in *lynciculus*, some long, some short, and others interrupted, formed of chestnut dots, which, over the rest of the surface, are sparsely scattered.

P. SEMPERI Dohrn. Pl. 37, figs. 92, 93, 94.

Shell rimate, acuminate-oblong, obliquely regularly plicate-striate, thin, semi-pellucid; reddish-corneous, sparsely dotted and flamed with brown. Spire somewhat acute, conic. Whorls  $5\frac{1}{2}$ , slightly

convex, rapidly enlarging, the last elongated, deeply descending in front, rounded at base. Aperture oblique, oval, concolored within; peristome white, somewhat thickened, narrowly expanded and reflexed, the margins joined by a whitish callus; columellar margin dilated, half-covering the umbilical chink. (*D.*)

Alt. 43, diam. 18; aperture, alt. 11, width 13 mill.

Alt. 37, diam. 17; aperture, alt. 10, width 12½ mill.

*Sonson*, prov. *Antioquia*, *U. S. of Colombia* (Wallis).

*Bulimus semperi* DOHRN, *Jahrb., D. M. Ges.*, ix, 1882, p. 103, pl. 3, f. 3-5.

Described from two specimens in O. Semper's collection. It stands rather isolated among the Colombian *Eurytus* species, and resembles most *B. floccosus* Spix, in general figure; but it differs widely from all allied species in the unusually small aperture.

#### Genus AURIS Spix, 1827.

(= *Pachyotus* + *Pelecychilus* + *Goniostomus* + *Anthinus* of authors).

*Auris* SPIX, *Testacea Fluvialia Brasiliensia*, p. 13, (for *A. melastoma* = *Bulimus melanostomus* Auctt.); also, p. 17, for *A. signata*; and lower legend on pl. 12.—GRAY, *List of the Genera of Recent Mollusca, their Synonyma and Types*, in *P. Z. S.*, 1847, p. 175 (type *Bul. melanostomus*). Not *Auris* Klein, *Tent. Méth. Ostr.*, 1753, = *Haliotis* (pre-Linnæan).

*Pachyotus* (in part) BECK, *Index Molluscorum*, p. 56 (for *alopocotis* = *aurisvulpina*, *bilabiatus*, *melanostomus*, *rhodospira* = *ilhecola*, *iostoma*).—GRAY, *List of Genera, etc.*, *P. Z. S.*, 1847, p. 175 (type *Vol. aurisvulpina*).—HERRMANNSEN, *Ind. Gen. Malac.*, ii, p. 187 (type *B. melanostomus* Swains.).—ALB., *Die Hel.*, p. 148.—ALBERS-MARTENS, *Die Hel.*, 1860, p. 190 (type *B. melanostomus* Swains.). Not "*Pachyota* Agas. in *Charp.*, *Cat. Moll. Suiss.*, 1837," so quoted in *Nomencl. Zool., Moll.*, p. 64, but not to be found in *Charpentier's Catalogue*.

*Otostomus* BECK (in part) *Index Moll.*, p. 55 (for *signatus*, *myotis* = *aurismuris*, *lateralis* and *lagotis* = *aurisleporis*, *navicula*).—GRAY, *List of Genera of Rec. Moll., their Syn. and Types*, *P. Z. S.*, 1847, p. 174 (type *A. signata*).—HERRMANNSEN, *Ind. Gen. Malac.*, ii, 1847-1849, pp. 179, 180 (type *B. signatus*). Not *Otostomus* ALB., *Die Hel.*, 1850, p. 152; ALB.-MART., *Die Hel.*, 1860, p. 210 (type *aurisleporis*).



*Gonyostomus* BECK (in part), Index Moll., p. 53, for *gonyostoma* (Fér.) Sowb., *concolor* Bk., *centiquadrus* Val., *multicolor* (Rang) King.—GRAY, List, etc., P. Z. S., 1847, p. 174 (type *gonyostoma*).

*Stenostoma* SPIX (in part), Test. Bras., 1827, not of Latr., 1810, nor of Wagl., 1826.

*Anthinus* ALB., Die Hel., 1850, p. 149; ALB.-MART., p. 189, type *B. multicolor*.

*Pelecychilus* Gldg., ALB.-MART., Die Hel., p. 188, not *Plekocheilus* Guilding, 1828, see this volume, pp. 62, 64.

For anatomy see SEMPER, Reisen in Arch. Phil., Landmoll., pp. 151, 155 (*bilabiatius*, *egregius*, *distortus*). BINNEY, Ann. N. Y. Acad. Sci., iii, p. 114 (*glaber*, *multicolor*, *egregius*).

Shell ovate, oblong, or fusiform, Bulimoid or Auricula-shaped, solid, of opaque, earthy texture and usually light color; rimate, perforate or umbilicate; always sculptured. Aperture about half the length of the shell, varying from ovate to ear-shaped and contorted, often notched or angular at base; outer lip reflexed, evenly arcuate or sinuous, often with a flange along its inner edge; columella with a strong or weak entering fold. Nepionic shell very small.

Mantle-edge with a long left body-lobe, or a small right and divided left lobe. Kidney short. Genital system without accessory organs, the spermatheca duct long, flagellum wanting (? or rarely present). Jaw plaited, the plaits few or many, and either almost completely soldered together and appearing merely striate, or less united and as in *Plekocheilus*. Dentition as in *Plekocheilus*, and showing the same variation.

Type *A. melastomus* (Swains.) Spix.

Ground snails, as far as known, ranging from Venezuela and Trinidad to southeastern Brazil, nearly all characterized by conspicuously earthy texture and peculiar modification of the aperture.

The genus is most nearly allied to *Plekocheilus*, the two groups being separated upon shell characters alone, the anatomy, so far as present information goes, affording no diagnostic differences. The conchological divergence, however, is so great between the two groups, that a union of them would seem a radical and uncalled-for measure; while their separation as distinct genera is obviously an aid to clear conceptions of the mutual relationships of the species involved.

Most of the forms herein referred to the genus *Auris* have formed part of the heterogeneous "genus" *Bulimus* of authors. I have already shown the nucleus of that genus (*Strophocheilus* + *Borus* + *Dryptus* + *Thaumastus* Pils. nec auctt.) to belong to the family HELICIDÆ; while the genera *Plekocheilus* and *Auris* are now for the first time sundered from "*Bulimus*," and transferred to their true family position in the BULIMULIDÆ. Regarding the contents of the genus *Auris*, we must not overlook the fact that although the component subgenera have never hitherto been united in one comprehensive group, yet even by Beck and Albers they are not far separated in the series; while von Martens, whose genius for perceiving natural groups in Pulmonata we are so often compelled to admire, arranges the subgenera of *Auris* in uninterrupted order.

The name *Auris* rests upon a basis precisely similar to that of *Strophocheilus* (p. 4). It was proposed by Spix for two species, *A. melastoma* and *A. signata*, which are placed by Wagner under "*Bulimus*" *melanostomus* and "*Auricula*" *signata*. Spix's nomenclature appears also on the plate illustrating these species. No more readily understood indication of the nature of *Auris* could be given; for good illustrations are held to define as well as the more formal but frequently quite insufficient diagnosis. The later and better-known name *Pachyotus* becomes a synonym of *Auris*; a fate we deplore the less because the course taken by Gray in naming *B. auris-vulpina* as type of *Pachyotus*, complicates the question of its use for the South American group. Moreover, *Gonyostomus* and *Otostomus* both precede *Pachyotus* in Beck's work, and the former of these names would necessarily take precedence for the present genus were it not for the prior and valid claim of *Auris*.

I have not seen specimens of *A. spectrum* or *dillwyniana*. The former of them seems to be merely a variety of *A. midas*. Of the other species I have seen a good many specimens of all but *A. perdix* Pfr. and *A. hauxwelli* Crosse, of these but few have been examined.

The species are illustrated on plates 38-44.

#### Key to Subgenera of *Auris*.

- I. Whorls of spire folded or plicate below sutures; form ovate,  
AURIS, p. 98.
- II. Whorls of spire not plicate.
  - a. Surface wrinkled, striate, or with long diamond-granulation.
  - b. Aperture two-thirds the alt., basin-shaped, lip with a



- wide concave flange, OTOSTOMUS, p. 107.  
*bb.* Aperture oblong or sinuous, shorter, lips not concave  
 or basin-shaped, EUDOLICHOTIS, p. 108.  
*aa.* Surface finely granulated spirally; lip narrow, not sinuous  
 or calloused, GONYOSTOMUS, p. 121.

Subgenus AURIS Spix (s. str.).

(=*Auris* plus *Pachyotus*, *Bulimus* of authors).

Shell umbilicate or rimate, ovate, rather stout, the whorls of the spire *distinctly plicate or folded* below the sutures, last whorl with or without oblique folds. Aperture ovate, the lip broadly reflexed, often bearing a callous flange. Columella with an oblique fold. Whorls  $4\frac{1}{2}$  to  $5\frac{1}{2}$ . Type *A. melastoma* Swains.

Distribution, Province of Bahia, Brazil.

The typical group of *Auris* consists of rather large ovate species with a series of folds below the sutures, a structure not existing in the other subgenera. Aside from this, there is much in common with *Eudolichotis* and *Otostomus*, especially the flange within the outer lip, the tendency to form a basal notch or sinus, and the general coloration.

Nearly every species of this subgenus occurs under two forms, usually identical in shape, but remarkably distinct in coloring of the mouth parts, and so far as my material shows, there are no intermediate examples. It is not improbable that this is purely a case of dimorphism, and the forms have no truly varietal status; but as the question has not before been adequately discussed, and observations bearing upon it by naturalists who have seen the species in their native forests are lacking, I have considered the interests of science best served by formal recognition of the several divergent forms, leaving open the question of their status, as one which I have no means of deciding. Compare, in this connection, Dohrn's remarks in *Jahrbücher d. D. Malak. Gesellsch.*, x, pp. 348, 349 (1883).

A study of well-preserved specimens of "*Bulimus*" *aurisvulpina* of St. Helena, convinces me that Fischer was entirely right in removing that species from the *Pachyotus* group. Its conchological features forbid any association of the St. Helena species with South American *Bulimi*.

*Key to species and varieties of Auris.*

- I. *Parietal wall* and lip bearing an *erect* callous flange,  
 a. Body-whorl with high, long oblique ridges separated by concave intervals,  
 b. Peristome white and yellow; columella white,  
*bilabiata.*  
 bb. Peristome black and yellow; columella black,  
*v. melanostoma.*  
 aa. Ribs on body-whorl shorter, subobsolete; form more obese.  
 b. Peristome and columella light, *egregia.*  
 bb. Peristome and columella black, *v. nigrilabris.*
- II. No flange on parietal wall; outer lip flattened or convex,  
 a. Lip, columella and interior of mouth very dark; a basal notch; dark spots between ribs on spire,  
 b. Ground color white; flange within outer lip long; a tooth at base of columella *melastoma.*  
 bb. Ground color fleshy; flange short, basal; no tooth on columella *v. brachyplax.*  
 aa. Interior of aperture and the lip white or partly white,  
 b. Columella rather straight; intervals between ribs on spire white or gray; surface *not* distinctly and evenly granulate.  
 c. A notch at base of columella; columella and lip white, golden-brown toward outer edge,  
*chrysostoma.*  
 cc. No notch; columella and flange on lip black,  
*v. swainsoni.*  
 ccc. No notch; columella and lip white; sculpture peculiar, *bernardii.*  
 bb. Columella twisted; intervals between ribs on spire dark; surface very distinctly, evenly granulate,  
*illheocola.*

A. BILABIATA Broderip & Sowerby. Pl. 39, figs. 10, 11, 12, 13.

Shell perforate, ovate-conic, solid, opaque and calcareous. White or pink, generally showing two dark clouds behind the lip, and often irregularly spotted with brown on the body-whorl. *Sculptured with prominent obliquely descending ridges*, generally seven to nine on last whorl, and not extending to suture above, more or less obso-



lete on the base, which is defined by a blunt keel; earlier whorls with strong but short subsutural ribs; the latter 2 whorls with a fine secondary sculpture of closely netted longitudinal wrinkles. Apex white, somewhat obtuse, with a terminal comma-shaped pit. Whorls 5.

Aperture vertical, about half the shell's length, contracted, ear-shaped, white or white and brown within; lip broadly reflexed, sinuous, white or ochraceous-brown; the inner edge of *lip and columella produced forward beyond the reflexion in a callous flange which is continued upon the parietal wall to the upper angle of aperture, and surrounds the cavity except for a sinus at the upper curve of the outer lip.* *Columella white, with a strong oblique fold; parietal wall white, with a yellow or ochraceous outer border.*

Alt. 48, diam. 29–31 mill.

*Brazil, at Bahia (Castelnau) and Ilheos (Moricand).*

*Bulinus bilabiatus* BROD. & SOWB., Zool. Journ., v, p. 49, suppl. pl. 40, f. 1, 2 (1829).—*Bulinus bilabiatus* DESH. in Lam., An. s. Vert., viii, p. 261, (1838); and in Fér., Hist., ii, p. 65, pl. 152, f. 6–8.—PFR., Conchyl. Cab., p. 35, pl. 5, f. 10, 11; Monogr., ii, p. 91; iii, p. 371 (excl. var.); iv, p. 439; vi, p. 76.—REEVE, Conch. Icon., pl. 33, f. 201.—HUPE in Anim. Nouv. ou rares rec. pendant l'Expéd. dans l'Amer. du Sud, sous la direction du Comte F. de Castelnau, Moll., p. 58, pl. 6, f. 1, 1a.—*Helix maximiliana* FER. in coll., and of MORICAND, Mém. de la Soc. de Phys. et d'Hist. Nat. de Genève, vii, 1836, p. 431, ? pl. 2, f. 20, scalariform monstrosity (exclusive of var. *minor*).—*Partula maximiliana* POT. & MICH., Galerie des Moll. Mus. de Douai, i, p. 198, pl. 20, f. 5, 6 (1838).—*Pachyotus bilabiatus* BECK, Index, p. 56.

One of the most remarkable Bulimoid snails, peculiar in the strong oblique ridges separated by concave intervals, and the erect callous flange around the aperture. The sculpture is far stronger than in the following species.

Two forms occur, indistinguishable as to shape, but apparently different in color at all stages of growth. Whether these are real subspecies, or merely two phases of a single dimorphic stock, we have no certain means of determining at present. The differences are not due to age, the young shells also sharing them.

*A. bilabiata* typical. Pl. 39, figs. 10, 11.

Flange around the mouth and across parietal wall yellow, ochraceous or white; outer edge of parietal wall yellow; columella and parietal wall within the flange white.

*A. bilabiata* var. *melanostoma* Moricand. Pl. 39, figs. 12, 13.

Flange around the mouth, with columella and parietal wall, black.

*Ilheos, Brazil* (Moric.).

*Helix maximiliana* Fér. var. *melanostoma* MORIC., Mém. Soc. Genève, vii, p. 431 (1836).

Figure 12 represents a young shell which has not formed the flange, but shows the black parietal wall and columella characteristic of this variety.

The following figures represent this form: Conch. Cab., pl. 5, f. 10, 11; Fér., Hist., pl. 152, f. 6; Rve., f. 201 b. The other figures cited above illustrate the typical *bilabiata*.

A. EGREGIA Jay. Pl. 39, figs. 14, 15, 16.

Shell perforate, ovate-conic, obese, solid, opaque and cretaceous. Pink or white, often marked with brown on latter part of body-whorl, and occasionally sparsely spotted. Earlier whorls with short, wide spaced vertical folds under sutures, the last whorl showing more or less distinct, short, obliquely descending folds above the periphery, often nearly obsolete; the base defined by an obtuse keel; surface everywhere finely roughened. Whorls about  $4\frac{1}{2}$ .

Aperture vertical, white within, ear-shaped; lip broadly reflexed, thin-edged; inner margin produced forward in a callous flange, which is continued across the parietal wall, and forms an elevated rim surrounding the aperture except for a wide sinus at the upper curve of outer lip. Peristome white or faintly yellow; columellar fold and parietal wall white.

Alt. 38, diam. 25 mill.

Alt. 33, diam.  $21\frac{1}{2}$  mill.

*Brazil, Ilheos* (Moricand); *Prov. Bahia* (Castelnau).

*Pupa egregia* JAY, Catal. Rec. Shells in coll. John C. Jay, M. D., edit. 2, 1836, [p. 81], pl. 1, f. 4, 4.—*Helix maximiliana* var. *minor* MORICAND, Mém. de la Soc. Phys. et d'Hist. Nat. de Genève, vii, p. 431 (1836); also viii, p. 141, pl. 3, f. 4 (living animal). Figure copied in M. E. Gray's Figs. Moll. Anim., pl. 302, f. 6.—*Bulimus egregius* MORCH, Catal. Yoldi, p. 28.—HUPE in Castelnau's Exped. Moll., p. 58, pl. 6, f. 2; pl. 9, f. 3.—*B. bilabiatus* var. *B.* PFR., Monogr., ii, p. 91; conf. Mal. Bl., v, 1858, p. 167.



Similar to *A. bilabiata*, but with the oblique folds of the last whorl far less developed, never extending below the periphery. The secondary sculpture also is less developed, and it is smaller than ordinary specimens of *bilabiata*.

This species exhibits two phases or two varieties exactly parallel to those of *A. bilabiata*, and evidently having the same status. Whether the variations in these species are comparable to the white and the pink mouthed forms of *Strophocheilus ovatus*, *oblongus*, etc., remains to be seen. I desire merely to direct attention to the apparently constant differences observed.

Typical *egregia* Jay. Pl. 39, figs. 14, 15.

Peristome white or isabella-yellow, the outer edge of parietal wall yellow or brownish, columella and parietal wall within the flange white.

Var. *nigrilabris* Pils. Pl. 39, f. 16.

Flange round the mouth, the whole parietal wall and the columella black.

*A. MELASTOMA* Swainson. Pl. 39, figs. 17, 18.

Shell perforate or umbilicate, ovate-conic, solid and earthy. White or fleshy-brown, irregularly variegated in coarse pattern with brown, having a paler band below the periphery; *the spire with purple-black spaces between the folds; mouth and peristome very dark.* Surface coarsely and flatly granulate in irregular pattern, most distinctly so on the base, the granulation obsolete above; spire with a series of strong folds below the suture, disappearing on the body-whorl or on its latter part. Whorls 5, convex.

Aperture vertical, ovate, *black within; lip flatly reflexed, wide, purplish with a brown edge, or blackish-brown,* the inner edge of outer and basal margins *thickened within, forming a rim or flange, interrupted by a squarish notch or sinus* at foot of the columella. Columella rounded, curving forward, its inner edge nearly straight, bearing a light denticle at base. *Parietal wall lined far inward with intense black-brown.*

Alt. 50-55, diam. 30 mill.

Alt. 46, diam. 27 mill.

*Province of Bahia* (Swainson); *environs of Bahia* (Moricand, Challenger); *Rio Janeiro* (Martinez).

*Bulimus melastomus* SWAINS., Zool. Illustrations, i, pl. 4 (1820).—*Bulimus melanostomus* DESH. in Fér., Hist., p. 66, pl. 152, f. 4, 5; in Lam., An. s. Vert., p. 252.—JAY, Catalogue, edit. 2, pl. 1, f. 3.—PFR., Conchyl. Cab., p. 37, pl. 13, f. 8, 9, 10, 11; pl. 5, f. 8, 9; Monographia, ii, p. 91; iii, 371; iv, 439; vi, 77.—REEVE, Conch. Icon., pl. 33, f. 203c.—Smith, P.Z.S. 1884, p. 280.—HIDALDO, Journ. Conch. 1870, p. 46.—*Auris melastoma* SPLX, Test. Bras. p. 13, pl. 12, f. 1, 2.—*Bulimus listeri* WOOD, Ind. Test. Suppl., pl. 7, f. 23.—*B. rhodospirus* POT. & MICH., Galerie Moll. Mus. de Douai, i, p. 152, pl. 15, f. 1, 2 (1838).—*Helix rhodospira* var. *vulgaris* MORICAND, Mém. Soc. Phys. et d'Hist. Nat. Genève, vii, 1836, p. 128, pl. 2, f. 29 (egg).—*Pachyotus melanostomus* BECK, Index Moll., p. 56.—*Pupa melanostoma* GRAY, Ann. of Philos. (n. ser.) ix, p. 413.—*Bulimus struthiolaris* MKE., Syn. Meth. Moll. Mus. Menkeano, edit. 2, 1830, p. 26, founded on Spix's figures.—*Bulla variegata* SILVEIR, (where?) teste Menke, l.c. (Confr. LISTER, pl. 29, f. 27, *Buccinum variegatum*, etc.). Not *Bulimus variegatus* Brug.=*Actæon flammeus* Gmel.

Differs conspicuously from *A. swainsoni*, *bernardii* and *illheocola* in the dark lip and aperture. The flange within the outer lip is generally more conspicuous and prolonged upward further than in *swainsoni*, but there is great variation in this character. Moricand and Reeve have included *swainsoni* and *illheocola* as varieties of *melanostoma*.

Typical *A. melastoma* Swains. Pl. 39, fig. 17.

Ground-color of shell white or whitish; outer lip purplish, with a brown or yellow border; *flange long, extending to upper curve of the outer lip; a denticle at foot of columella.*

Var. *brachyplax* Pils. Pl. 39, fig. 18.

Ground-color of shell flesh-colored or brownish; *flange much shorter, basal; no denticle at foot of columella; subsutural folds obsolete on body-whorl. Size smaller. Alt. 44, diam. 28 mill.*

As in the case of *A. bilabiata*, I cannot decide on the merits of the above varietal form, but merely place the facts on record.

*A. CHRYSOSTOMA* Moricand. Pl. 38, figs. 6, 7.

Shell perforate, ovate-conic, solid and cretaceous; whitish with irregular or interrupted longitudinal brown stripes, a pale zone below the periphery, the spire pale fleshy *without black spots* between the subsutural folds. Surface superficially granular, more distinctly so



on base, the whorls of spire strongly plicate below the sutures, folds wanting or reduced to ripples on body-whorl, which is faintly keeled at the subperipheral light band. Whorls 5-5½; suture margined.

Aperture vertical, *white within* (or black toward peristome); a more or less obvious rounded notch or sinus at junction of columella with basal lip; outer lip broadly reflexed and recurved, *white with a golden brown outer border* its inner edge bearing a slight inward-projecting rim or flange, which may be either black or white; outer margin of the basal lip usually produced downward in a lobe. Parietal wall white within, with a wide black outer band, the columella heavy, slightly convex, white (or in specimens with black flange within outer lip, the columella and entire parietal wall are black).

Alt. 60, diam. 38 mill.

Alt. 53, diam. 33 mill.

*Environs of Bahia, Brazil* (Moricand).

*Helix* (*Cochlogena*) *rhodospira* var. *chrysostoma* MORIC., Mém. Soc. Phys. et Hist. Nat. de Genève, vii, 1836, p. 428.—*Bulimus swainsoni* PFR., Zeitsch. f. Malak., 1845, p. 156; Conchyl. Cab., p. 193, pl. 56, f. 9; Monogr. ii, p. 92; iii, 371; iv, 439; vi, 77.—DESH. Fér., Hist., p. 66, pl. 152, f. 1, 2.—*B. melanostoma* var. REEVE, C. Icon., pl. 33, f. 203a.—*Bulimus melanostomus* var. SOWB., Conch. Illust., f. 88.—*Bul. melanostomus scalaris* DOHRN, Jahrb. d. D. Malak. Gesel. x, pl. 11, f. 4.

This species has generally been known by the name given by Pfeiffer in 1845, but it was first described by Moricand as a variety of *rhodospira* (*melastoma*) in 1836.

While closely allied to *melastoma*, it differs from that species in lacking black spots between the folds on the spire, and in the greater prevalence of white in the aperture and on the outer lip. As in all preceding species of this genus, there are two color-varieties.

Typical *chrysostoma* Moric., pl. 38, fig. 6, in which the slight rim or flange within the lip, the columella, and the inner part of the parietal wall are white, and there is a more or less distinct basal notch.

Var. *swainsoni* Pfr., pl. 38, fig. 7, in which the entire parietal wall, the columella, and the inner margin of lip are black, and the baso-columellar curve while abrupt, is not excavated into a notch or sinus.

All of the published figures cited in the above references represent the var. *swainsoni*; typical *chrysostoma* being, we believe, illustrated here for the first time. In some large specimens of *swainsoni*, the basal lip is much produced, like the lobe of the ear; this being shown in a specimen before me and in the figure of Férussac. The coloration is more mottled in these than in typical *chrysostoma*, and shows a sparse sprinkling of small, intense brown round spots. Specimens of both *chrysostoma* and *swainsoni* are before me from Bahia.

*A. BERNARDII* Pfeiffer. Pl. 38, figs. 8, 9.

Shell perforate, ovate-conic, solid and opaque, fleshy-white with bold undulating brown longitudinal stripes, in places broken or dislocated, and below the periphery interrupted by a pale band; the spire pale, without black spots between the folds, the apex white. Surface smoothish, but *peculiarly sculptured* by obliquely-descending series of long granules (pl. 38, fig. 8); the base more densely granulate, the granules crowded as in *A. illheocola*. Whorls of spire strongly plicate below the sutures, which are slightly crenulated. Whorls  $5\frac{1}{2}$ .

Aperture ovate, vertical, white within, with dark marbling corresponding to the external coloration; lip broadly and rather flatly reflexed, recurved, white, with a narrow yellowish outer edge; inner margin slightly thickened, but without a distinct rim or flange. Columella oblique, straight, forming an angle with basal lip but not notched at base. Parietal wall black. Alt. 60, diam. 34 mill.

*Province of Bahia, Brazil* (R. Swift).

*Bulimus bernardii* PFR., Malak. Bl., iii, 1856, p. 52; Novit. Conch. i, p. 118, pl. 33, f. 3-5; Monogr., iv, p. 440.

This species is the rarest form of the restricted subgenus *Auris*. It differs from *A. illheocola* in color-pattern, sculpture, less lengthened form and straight columella. *A. bernardii* is most nearly allied to *A. chrysostoma*, differing from the typical form of that species in the less developed hardly noticeable rim or flange within the lip, the absence of any trace of a notch at base of columella, and the extension of black inward upon the parietal wall. *A. bernardii* differs from *A. chrysostoma* var. *swainsoni* in the white lip and columella and lack of a lobe on the basal lip; agreeing with *swainsoni* in absence of the basal notch.





The minute sculpture of *bernardii*, as shown in fig. 8, differs from that of the allied species, but occasional specimens of *chrysostoma* seem to offer an approach to it in pattern. The species is a critical one, not to be hastily judged on the evidence of the two specimens known to Pfeiffer, and the single one before me, these being so far as I know, the only examples on record.

A. *ILLHEOCOLA* Moricand. Pl. 39, fig. 19.

Shell perforate, lengthened ovate-conic, thin or moderately solid. Fleshy-pink, closely and indistinctly striped or netted with a slightly darker shade, the spaces between folds on the spire dark. *Surface conspicuously and densely granulated* except on earlier whorls, the granules lighter, elongated, and readily visible with the naked eye. Whorls of the spire with a series of conspicuous folds below the sutures, which are finely crenulated. Whorls 5½.

Aperture ovate, subvertical, white or nearly so inside (but in immature shells showing conspicuous brown stripes); lip broadly reflexed, its face convex; white, with a yellow outer border, sometimes very pale; *no trace of a flange* on inner edge of lip, and the columella curves into basal lip *without any indication of a notch*. Columella white, convex and twisted; parietal wall white within, bordered by a wide black band.

Alt. 59, diam. 31 mill.

*Ilheos, Province of Bahia, Brazil.*

*Helix* (*Cochlogena*) *rhodospira* var. *illheocola* MORICAND, Mém. Soc. Phys. et Hist. Nat. de Genève, vii, p. 428 (1836).—*Bulimus illheocola* PFR., Zeitschr. f. Malak., 1845, p. 156; Conchyl. Cab., p. 194, pl. 56, f. 10; Monogr., ii, p. 92; iii, 371; iv, 439; vi, 77.—*Bulinus melanostomus* var. ? SOWB., Conchol. Illustr., f. 79.—*Bulimus melanostoma* REEVE, Conch. Icon., pl. 33, f. 203b.—DESH. in Fér., pl. 152, f. 3.

Differs from all the preceding species in the coarser and more regular granulation, more lengthened contour, and more roseate suffusion. There is no trace of an inner lip-flange, nor of a basal notch. The subsutural folds do not often extend as far down as the body-whorl; and the color pattern is subdued in tone, much less distinct than in *chrysostoma* and *bernardii*.

Pfeiffer records a specimen measuring alt. 69, diam. 33 mill.; last whorl more ventricose. Is the assigned alt. an error?

## Subgenus OTOSTOMUS Beck, 1837.

(For references see p. 95).

Shell obliquely ovate, of solid cretaceous texture, umbilicate; spire smooth without folds or rib-striæ; aperture oblong, produced forward below, *two-thirds the shell's length*; *peristome basin-shaped*, the outer lip broadly reflexed, with an inner concave flange, the columella with a strong, plate-like fold. Type *Auris signata*.

The only known species inhabits the Province of Bahia, Brazil. The flanged lip, fold-bearing columella, and solid, cretaceous texture, all indicate the close relationship of this form to the typical *Auris* and to *Eudolichotis*, and sunder it from such forms as *Bulimus aurisleporis*.

The type of *Otostomus* was expressly stated by Gray and by Herrmannsen as early as 1847, to be *A. signata*. The subsequent selection of *aurisleporis* as type of *Otostomus* by von Martens (1860) cannot therefore be held valid.

A. SIGNATA Spix. Pl. 40, fig. 20.

Shell umbilicate-riate, ear-shaped, solid, strong and opaque, calcareous; white or nearly so, with four wide brown spiral bands, often much interrupted or transformed into vertical streaks; spire white or whitish, the *apex black*, several early whorls with a black sub-sutural band, rarely lacking. Surface lusterless, roughened by very irregular longitudinal wrinkles. Spire conic, short, apex obtuse; whorls 5, the last oblong, distorted.

Aperture two-thirds the shell's length, oblong, oblique, produced forward below, the opening very much contracted; peristome white, broadly reflexed, thick, its face basin-shaped, widened within by a broad concave flange extending from base to above middle of outer lip, its edge often weakly crenulated; columellar margin reflexed, thick, long and straight, its inner edge showing a rounded sinus below and a wide lamellar fold above; parietal wall short, covered with a white callus. Alt. 41, diam. 23 mill.

*Province of Bahia, Brazil.*

*Auris signata* SPIX, Test. Bras., p. 17, pl. 12, f. 3.—*Auris vittata* SPIX, l. c., f. 4.—*Auricula signata* WAGNER, in Spix, p. 17.—*Helix signata* MORIC., Mém. Soc. Phys. Hist. Nat. Genève, vii, p. 431.—*Bulimus signatus* DESH. in Lam., An. s. Vert. viii, p. 254; in Fér., Hist., ii, p. 64, pl. 152, f. 15–18.—GRATELOUP, Actes Soc. Linn. Bord., xi, p. 422, pl. 2, f. 13.—PFR., Conchyl. Cab., p. 145, pl. 18, f.



14, 15; Monogr., ii, p. 90; iii, 376; iv, 445; vi, 80. —REEVE, Conch. Icon., pl. 33, f. 200. —*Otostomus signatus* BECK, Index, p. 55.

A peculiarly isolated species, having somewhat the hunch-backed shape of some *Auriculas*. Its nearest allies are the forms included in the following subgenus. The apical whorls, when unworn, show an excessively minute and superficial grated sculpture, as in *Drymæus*. The anatomy is unknown.

The form having longitudinal bands was called *vittata* by Spix, but it seems to be merely an extreme pattern formed by the interruption of the irregular spiral bands of ordinary specimens.

#### Subgenus EUDOLICHOTIS Pilsbry, 1896.

*Pelecypchilus* Guilding, ALBERS-MARTENS in Die Heliceen, 1860, p. 188 (exclusive of last species). Not *Plekocheilus* Guilding.

Shell fusiform or long-ovate, umbilicate; striped or variegated with brown on a light ground. Whorls  $4\frac{1}{2}$ – $5\frac{1}{2}$ , slightly convex, the last either pinched at base and behind the lip or rounded. Aperture about half the length of the shell, ear-shaped, the outer lip reflexed, sinuous, usually thickened within; columella with an oblique fold, often very strong. Surface *striate or diamond-granulate, never with spirally arranged granules*, some whorls of spire rib-striate. Type *A. distorta* Brug.

Distribution, Venezuela, Trinidad and some adjacent islands; Para, Brazil. Living on trees.

The shells of this group have much in common with the *Auris* species, *A. (Eudolichotis) sinuata* having the basal notch as in *Auris melastoma*, and *A. (Eudolichotis) midas* recalling *Auris illheocola*. *Eudolichotis* is also allied to *Gonyostomus*, but differs markedly in the style of sculpture and the sinuous or calloused peristome.

The species are all excessively mutable, the range of individual variation almost connecting some species which are typically very unlike. In many cases strong variations occur indiscriminately among individuals from one locality, and are not correlated with geographic range; thus the specimens of *A. sinuata* or *A. euryomphalus* which I have figured are all from the same place. In *A. distorta* and *A. glabra* an attempt has been made to diagnose racial forms; but series of specimens with geographic data which would ordinarily be held sufficient for satisfactory specific work, are in *Eudolichotis* comparatively inconclusive. The results recorded be-

low are based upon a study of a large number of shells of nearly all the species; but no very large portion of the area probably inhabited by these species is covered by my series, nor by the specimens studied by other authors.

It is hardly necessary to state that the "key" here presented merely gives suggestions as to the identity of any given specimen. No key can be made which will open to us the labyrinth of variations—more tortuous than King Minos' Cretan maze—which surrounds the "specific types" of this company.

*Key to species of Eudolichotis.*

- I. Outer lip sinuous, contracted or straightened in the middle.
  - a. Aperture long and narrow, produced at base.
    - b. Lip narrow, not calloused; brown with white zigzag hydrophanous lines; papillose, *hauxwelli*, p. 120.
    - bb. Lip wider, calloused; no hydrophanous markings; not papillose; base of shell pinched,
      - distorta* (p. 109), *aurissciuri*, p. 112.
  - aa. Aperture shorter and wider, hardly produced below,
    - glabra* (p. 113), *lacerta*, p. 115.
- II. Outer lip arcuate, not contracted in the middle.
  - a. Base decidedly pinched; lip thickened within toward the base, where there is a notch.
    - b. Large, solid, finely rugose; striped and speckled,
      - sinuata*, p. 116.
    - bb. Small, thinner, smoothish; zigzag-streaked,
      - eurymphala*, p. 116.
  - aa. Base not distinctly pinched; outer lip not distinctly calloused, with no basal notch,
    - perdix* (p. 118), *dillwyniana* (p. 118), *midas*, p. 119.

A. DISTORTA Bruguière. Pl. 40. figs. 21-32.

Shell oblong-fusiform, umbilicate or perforate, solid and strong. Light yellow or whitish, with brown longitudinal stripes, which may be narrow and distinct or wide, zigzag, flecked with whitish or variously interrupted; sometimes tawny-brown throughout; or brown, blotched with white. Surface rib-striate on spire, the last whorl cut into coarse diamond-shaped granules, especially on the back. Whorls  $5\frac{1}{2}$ , gently convex, the latter half of the last strongly



compressed, and excavated behind the peristome; suture rather shallow, regularly descending, somewhat margined below.

Aperture half the total length or more, long and narrow, *the opening very much contracted and sinuous*. Peristome white (or deep brown), broadly reflexed; *outer lip arcuate above, then contracted and bearing a blunt projection within*; its lower two-thirds widened by an internal thickening; columellar lip reflexed, sinuous, *bearing a very strong entering fold*; *basal margin contracted, channelled*; parietal callus moderate.

Alt. 54, diam. 23 mill.

Alt. 56, diam. 21 mill.

*Puerto Cabello, La Guayra, Caracas, Chino*, on banana leaves; *Caripe; Ejido, etc., Venezuella*.

*Auris Midas distorta* CHEMN., Conchyl. Cab., x, p. 146, pl. 149, f. 1395-96.—*Bulimus distortus* BRUG., Encycl. Méth., i, p. 344.—PFR., Conchyl. Cab., p. 45, pl. 14, f. 1, 2; Monogr., ii, p. 88; iii, 372; iv, 441; vi, 78.—REEVE, Conch. Icon., pl. 54, f. 358.—MARTENS, Die Binnenmollusken Venezuela's, in Festschrift zur Feier des 100 jährigen Bestehens der Gesellsch. Naturforsch. Freunde zu Berlin, 1873, p. 175.—*Voluta australis* var. DILLW., Descr. Catal., 1, p. 500.—*Helix (Cochlogena) distorta* FER., Prodr., no. 443.—*Pelekocheilus distortus* BECK, Index, p. 54.—*Pupa distorta* GRAY, Ann. of Philos., n. ser., ix, p. 412.—*Otostomus (Pelecychilus) distortus* SEMPER, Reisen im Archip. Phil., p. 155, pl. 15, f. 3; pl. 17, f. 2 (anatomy).—*Plecochilus guairensis* JOUSSEAUME, Mem. Soc. Zool. France, ii, p. 244, pl. 9, f. 11 (1889).

An extremely variable species, differing from its allies mainly in having the mouth more contracted.

Typical *A. distorta* (pl. 40, figs. 24, 25, 26) is an abundant species in the neighborhood of Puerto Cabello. It is large (about 55 mill. alt., but sometimes smaller, at times as large as 72 mill.), very distinctly diamond-granuled on the back, with pinched basal keel, a capacious pit and trench behind the outer lip, and an extremely contracted aperture, the very strong, transverse columellar fold approaching near to the boss within the outer lip. In most specimens the lip and columellar fold are white, parietal callus translucent; but many occur with the fold partly brown, and the parietal callus dark. These lead toward the rarer form in which the whole peristome is intense brown (fig. 32, specimen from Arva).

Var. *SUBLÆVIS* Pils. (pl. 40, fig. 30, from Arva, figs. 28, 29, from Puerto Cabello, and fig. 27, from La Guayra) is constantly smaller (alt. 34–42 mill.) and *smoother*; lip white or black-brown; external coloration creamy, cream and brown, or white and purplish, some examples being boldly maculated. Form of aperture typical, or with a callus buttress below outer end of columellar fold (fig. 27).

Var. *GRACILIS* Pils. (pl. 40, fig. 31). Lengthened and slender, smoothish, the sculpture sub-obsolete on body-whorl, except at base; basal keel strongly pinched, as in typical *distorta*, but no noticeable pit or trench behind outer lip. Fleshy, with narrow, spaced, obliquely descending dark stripes. Aperture less than half the alt.; outer lip scarcely sinuous; columellar fold strong, compressed and more horizontal than in the type. Suture conspicuously margined.

Alt. 41, diam. 15 mill.

Alt. 38, diam. 14 mill.

Described from specimens in the R. Swift collection in Mus. A. N. S. P., received by him from Maracaibo, and believed by him to be from Cucuta, Prov. Pamplona, U. S. Columbia. It has the slender contour of var. *guairensis*, and the pinched basal keel of typical *distorta*.

Var. *GUAIRENSIS* Jousseaume. (pl. 40, fig. 21, Jousseaume's type, and 22, from La Guayra; fig. 23, from Caracas.) Smaller, more lengthened and more slender than the typical *distorta*; base less pinched. Color whitish or fleshy, clouded longitudinally with purplish-brown. Surface strongly sculptured with longitudinal close wrinkle-striæ, conspicuous below sutures, more or less broken into long granules on body-whorl, which is less compressed than in *distorta* and scarcely excavated behind outer lip.

Aperture generally less than half the alt. of shell, the opening less sinuous, less contracted than in *distorta*. Outer lip less thickened inside and but slightly sinuous; basal margin less contracted; parietal fold rather more horizontal, and often with a callus below its outer end. Lip white; parietal wall generally brownish within.

Alt. 40, diam. 15 mill.

Alt. 45, diam. 16 mill.

*La Guayra* (Simon! Swift); *Caracas* (F. Cocking!); *Puerto Cabello* (Starke! in Swift Colln.).



The slender form, vertically plicatulate sculpture, less pinched base, less sinuous outer lip and consequent lack of excavation behind it, would entitle this to rank as a species distinct from *distorta* were it not for the intermediate specimens I have seen, which do not allow me to retain it specifically apart.

Var. *BISUTURALIS* Pils. Pl. 44, figs. 81, 82.

Shell with the spire more slender and *whorls more convex* than in *A. distorta*, solid, fleshy or buff whitish, with a few oblique stripes or none. Surface with the growth-wrinkles somewhat sinuous or interrupted on the last whorl, about as in *A. glabra*. Whorls  $5\frac{1}{2}$ , separated by impressed sutures, which are bordered below by a *narrow margin defined by a distinct groove*; the last whorl compressed at base and behind the peristome.

*Aperture more open* than in any other form of *A. distorta*, much as in *A. glabra*, the outer lip less calloused within than in *A. distorta* var. *guairensis*; base moderately produced. Columella with the usual convex fold, bearing a rather deep-seated, narrow, subhorizontal callous flange on its lower edge. Parietal wall white or faintly brownish.

Alt. 44, diam. 18 mill.

Alt.  $40\frac{1}{2}$ , diam. 17-19 mill.

*San Jose de Cucuta, Colombia* (E. S. Penny, in Swift Coll.).

The aperture is more open and the columellar fold is very much less developed than in *A. distorta*; but the compressed base and form of the columellar fold forbid a union with *A. glabra*. Five specimens examined.

A larger specimen, more variegated with brown, and without the superimposed narrow callus on the columella, but still, in my opinion, referable to this subspecies, is before me, labelled "Bogota, N. G., J. Akhurst."

*A. AURISSCIURI* Guppy. Pl. 41, figs. 42, 43, 44.

Shell umbilicate, ovate-fusiform, generally rather thin and diaphanous, sometimes more solid and opaque. Whitish, with obliquely-descending stripes of brown or purple-brown, sometimes interrupted and anastomosing. Surface smoothish, rather faintly wrinkle-striate, the striae more or less broken into diamond-granules on the base. Whorls slightly over 5, the last flattened and more or less excavated behind the lip, the base prolonged and decidedly pinched.

Aperture over half the alt., long and narrow, faintly showing the stripes within, *contracted in the middle*. Peristome narrowly reflexed, *thin*, white; outer lip narrow and arcuate above, then gently bent inward, its lower two-thirds wider, *with a median and a lower slight inward widening*; base narrow, *prolonged*, guttered within; columella vertical, sinuous, with a dark convex fold above, surmounted by a white callous fold, and an inconspicuous inward thickening below; a visible gutter at junction of columella with parietal wall. Parietal wall covered with a deep brown, thin callus.

Alt. 38, diam. 17 mill.

Alt. 34, diam. 15 mill.

Alt. 30, diam. 13 mill.

*Trinidad*, on trees (Gill, Guppy).

*Bulimus ægotis* Mke., PFEIFFER, Conchyl. Cab., p. 43, pl. 13, f. 5, 6. Not *B. ægotis* Menke, 1830.—*Plekocheilus aurissciuri* GUPPY, Ann. Mag. N. H. (3), xvii, 1866, p. 51; Conf. Proc. Sci. Asso. Trinidad, 1866, p. —*B. glaber* var. *aurissciuri* GUPPY, Journal of Conchology, Leeds, vii, p. 218 (1892).—*Bulimus (Plekocheilus) auris-sciuri* BLAND, Amer. Journ. Conch., iv, 1868, p. 182.—PFR., Monogr., viii, p. 110.—*Bulimus (Plecochilus) auris-sciuri* CROSSE, Journal de Conchyliologie, 1890, p. 41.—*Bulimulus auris-sciuri* PACE, Proc. Malac. Soc. Lond., i, p. 151, 152, figs. i-iv (Anatomy).

Closely allied to *A. glabra*, but the mouth is longer, more produced and narrow below, and the shell thinner with strongly pinched base as in *A. distorta*. It may be found to intergrade with *glabra*, however, in which case the Trinidad form will stand as a subspecies or variety, as Guppy ranks it in his latest consideration of the subject.

This form was first described and figured by Pfeiffer, many years ago as *B. ægotis* Menke, the type being from Menke's collection; but Menke had previously used the name *B. ægotis* as an equivalent of *Voluta glabra* Gmel., thus preventing the later definition of the form in his collection under the same name.

A. GLABRA Gmelin. Pl. 41, figs. 33, 34, 35, 36, 37.

Shell perforate, ovate-fusiform, *solid and strong*; whitish, with numerous longitudinal purple-brown stripes, usually waved, and as wide as the light intervals; the spire often flesh colored. Surface smoothish, weakly wrinkle-striate, more strongly so on the back of body-whorl, where the striæ are undulating and in places somewhat



dislocated, forming long granules. Whorls  $5\frac{1}{2}$ , slightly convex, with well-marked suture which is narrowly margined on last whorl. No pit or groove behind the outer lip.

Aperture slightly over half the shell's length, a little oblique, oblong; peristome narrowly reflexed throughout, and *thick*, white or isabelline; *outer lip regularly curved* or slightly bent inward at the middle, a trifle thickened within from the middle down; basal margin narrowly rounded or subangular. Columella widened above, bearing an obliquely entering fold, strong, high and white-calloused in adult specimens. Parietal wall and root of columella black-brown (rarely translucent-white).

Alt. 47, diam. 19 mill.

Alt. 40, diam. 18 mill.

Alt. 35, diam. 17 mill.

*Island of Tobago!* (R. Swift); *Montserrat Hills, Trinidad* (Dr. B. Sharp!).

*Voluta glabra* GMEL., Syst. Nat., (13), p. 3436.—WOOD, Index, Test., pl. 19, f. 5a.—*Bulimus glaber* DH. in Lam., An. s. Vert., viii, p. 258.—PFEIFFER, Monogr., ii, p. 89; iii, 373; iv, 442; vi, 78.—REEVE, Conch. Icon., pl. 54, f. 357.—*Helix* (*Cochlogena*) *auris caprinus* FER., Prodr., no. 442.—*Pelekocheilus caprinus* BECK, Index, p. 55.—*Pupa auris sileni* GRAY, Ann. of Philos. n. ser., ix, p. 412.—*Auricula sileni* LAM., An. s. Vert., vi, pt. 2, p. 138; Encycl. Méth., pl. 460, f. 4.—*Pelekocheilus undulatus* BECK, Index, p. 55.—*Ellobium flammeum* BOLTON, Mus. Bolt., 1798.—*Bulimus ægotis* MENKE, Synops. Meth. Moll. Mus. Menkeano, edit., 2, 1830, p. 26 “(*Auricula Sileni* Lam., *Helix auris caprina* Fér., *Voluta glabra* Gm.)”; no description. Not *B. ægotis* Pfr., Conchyl. Cab.

The typical *A. glabra* is a strong, solid shell when mature, with thick lip, strong, callous columellar fold; the base but little pinched, and the aperture not much produced downward. It is decidedly more solid than *A. aurissciuri*, and much less compressed below. I know of no authentic localities for it on the Spanish main, nor on Antillean islands other than those mentioned above.

The figures show the main aspects of variation. Fig. 33, may be regarded as altogether typical. Fig. 37 represents an albino specimen collected by Dr. B. Sharp.

Var. GRENADENSIS Guppy. Pl. 41, figs. 38, 39.

Smaller and more ventricose than typical *glabra*; very *solid and strong*; fleshy-brown and whitish, obscurely streaked, the streaks

*much speckled and mottled. Whorls 5. Lower two-thirds of the outer lip thickened within; parietal wall in adult specimens covered with a heavy white callus.*

Alt. 33, diam. 17 mill.

Alt. 37, diam. 18½ mill.

*Island of Grenada (Swift).*

*Bulimus glabra* PFR., Conchyl. Cab., p. 42, pl. 13, f. 7.—*Pelecychilus glabra* BINNEY, Ann. N. Y. Acad. Sci., iii, p. 114, pl. x. f. J (jaw and dentition).—*Plekocheilus glaber var. grenadensis* GUPPY, Ann. Mag. N. H., (4), i, p. 436 (1868).

This seems to me fairly recognizable as an insular race, although I have but ten specimens of it before me.

A. LACERTA Pfeiffer. Pl. 41, figs. 40, 41.

Shell rimate-umbilicate, long-ovate, rather thin or somewhat solid. Yellowish-white, with *obliquely longitudinal brown stripes*, either regular, undulating or somewhat dislocated. Surface wrinkle-striate, broken into diamond-granules on the last whorl. Whorls 5, somewhat convex, the last but little or not all compressed behind the lip, having some impressed transverse lines there but no pit or constriction; base but little pinched.

Aperture somewhat over half the alt., oblong, striped within, hardly contracted in the middle. Peristome well reflexed, with recurved edge, white, the outer lip slightly thickened within near the middle and below; *basal lip recurved*, narrowly rounded; columellar lip wide, with a strong, spirally ascending white callous fold above, seated on a dark base. Parietal wall bearing a *thin translucent film*.

Alt. 34, diam. 16 mill.

Alt. 33, diam. 14 mill.

*Para, Brazil.*

*Bulimus lacerta* PFR., P. Z. S., 1855, p. 94, pl. 31, f. 15; Novit. Conch., i, p. 64, pl. 18, f. 5, 6; Monogr., iv, p. 442; vi, 78.

This is another form very closely allied to *A. glabra*. It is smaller and thinner, with thinner lip, more regular granulation and striping, and especially differs in the abrupt curve of the lip above, which at the upper insertion lies nearly at a right angle with the outer lip. *A. aurissciuri* has the base more pinched and the aperture more prolonged at base. There is not much variation in the dozen specimens before me from Para.



A. SINUATA Albers. Pl. 42, figs. 49, 50, 51, 52, 53, 54.

Shell compressed-umbilicate, ovate oblong, solid. Whitish or yellow, irregularly striped, dotted and spotted with brown or purple-brown. Surface smoothish, striate on spire, the body-whorl obscurely wrinkle-granose, and showing traces of a microscopic granulation. Whorls  $5\frac{1}{2}$ , the last somewhat ascending in front, the base abruptly *pinched into a raised convexity defined by a scar-like groove*. Aperture vertical, exceeding half the alt. of shell, elliptical, angular above and *with a conspicuous notch or sinus at base*. Peristome white, reflexed, the edge recurved; outer lip evenly curved, its *lower half or third thickened within and often denticulate*, terminating abruptly in a boss or tooth at the base. Columellar lip broadly reflexed, flaring forward (fig. 51). Columella white, sinuous, with a long spirally entering fold above. Parietal wall covered with a translucent film.

Alt. 52, diam. 23 mill.

Alt. 44, diam. 24 mill.

*Puerto Cabello, Venezuela* (C. F. Starke and others).

*Bulimus sinuatus* ALB., Malak. Bl., i, 1854, p. 32.—PFR., Novit. Conch., i, p. 37, pl. 10, f. 18–20; Monogr., iv, p. 442.—MARTENS, Binnenmoll. Venez., in Festchr. 100-Jährigen Feier des Bestehens Naturforsch. Fr. Berl., p. 176.

Differs conspicuously from *A. distorta, glabra* and their allies in the channel or notch at the base and the differently formed outer lip. It is allied to *A. euryomphala, perdix*, etc.

Variation is extreme in this as in other species of the group. The basal notch may be either wide (fig. 49 typical), very narrow (fig. 50), or even obsolete (fig. 53). The columellar lip also varies in form, fig. 54 representing a specimen in which it is deeply sinused. The callous ledge within outer lip may bear several small denticles and end in a strong tooth, or it may be smooth, with no tubercle below. Sometimes the columellar fold is scarcely visible from in front.

A. EURYOMPHALA Jonas. Pl. 42, figs. 55–61.

Shell umbilicate, ovate-oblong, thin but rather strong. *Fleshy-white, with irregular, closely and strongly zig-zag brown or purplish stripes, and often scattered dots. Surface smooth, with superficial, inconspicuous growth-wrinkles only.* Whorls  $5\frac{1}{2}$ , slightly convex, the last gently ascending in front, the base more or less pinched up,

with a groove or two defining the convexity. Suture narrowly margined.

Aperture about half the length of shell or less, vertical, or with the base carried forward. *Peristome* narrowly reflexed, thin, white; the outer lip arcuate or irregular, somewhat thickened within toward the base, where there is a *more or less developed notch or spout*. Columella bearing a strong or weak spirally ascending fold above, brown, or with a white edge; the reflexed margin sinuous, usually flaring forward.

Alt. 40, diam. 18; alt. of aperture 21–22½ mill.

Alt. 37, diam. 16; alt. of aperture 16 mill.

*Caripe* (Jonas); *Caracas* (Moritz, Lansberg, Ernst, Cocking); *Venezuela*.

*Bulimus euryomphalus* JONAS, Zeitschr. f. Malak., 1844, p. 36; Molluskolog. Beitr., p. 26, pl. 10, f. 15.—PHIL., Abbild., iii, p. 37, pl. 8, f. 2.—REEVE, Conch. Icon., pl. 54, f. 356.—PFR., Monogr., ii, p. 88; vi, p. 78.—MARTENS, Binnenmoll. Venez. in Festschr. 100-Jährigen Bestehens Ges. Naturf. Fr. Berlin, 1873, p. 176.—*Bulimus otostomus* PFR., P. Z. S., 1854, p. 291; Novit. Conch., i, p. 31, pl. 8, f. 12, 13; Monogr., iv, p. 442.—MARTENS, *l. c.*, p. 177.

The variations seen in Caracas specimens are well shown by the illustrations. Figs. 59, 60, 61 represent typical *euryomphala*, in which the aperture is long and subvertical, guttered at base, and the lip is gently arched toward the upper insertion. Figs. 56, 57 are Pfeiffer's type of *B. otostomus*, in which the aperture inclines obliquely forward toward the base, is short and trapezoidal, and the outer lip is very strongly arcuate toward the upper insertion. In fig. 55, these characters are more obvious. In fig. 58, is shown the profile of a shell like *otostomus* in the angle of aperture, but like *euryomphala* in its comparative size, intermediate between the two in the curvature of the lip. Other examples before me unite the several differential features of the two forms in such various styles of combination that I do not see how any specific or varietal status can be sustained for *B. otostomus*.

In a few of the larger specimens there is some trace of the long-grained sculpture of *A. sinuata*; but the constantly smaller size, smoothness, zig-zag pattern and less developed calluses of the mouth are sufficient specific distinctions. There is sometimes a strong groove at root of columella, and the earlier whorls are faint orange in some shells.



*A. PERDIX* Pfeiffer. Pl. 41, figs. 45, 46, 47, 48, 49.

Shell perforate, ovate-oblong, solid, closely striate; whitish, with flames, spots and dots of blackish. Spire conic, the apex rather obtuse; suture margined. Whorls  $5\frac{1}{2}$ , but slightly convex, the last about as long as the spire; base slightly compressed around the narrow perforation.

Aperture oblong, showing inside the external coloration; peristome expanded throughout, the columellar margin somewhat vaulted; columella obliquely folded above, slightly arcuate. (*Pfr.*).

Alt. 36, diam. 15; alt. of aperture 19 mill. (type).

Alt. 31 mill. (Caracas specimen).

*Agua de Obispo*, U. S. Colombia (Funck); *Caracas*, Venezuela (Lansberg).

*Bulimus perdix* PFR., P. Z. S., 1847, p. 230; Conchyl. Cab., p. 147, pl. 39, f. 1, 2; Monogr., ii, p. 89; vi, p. 23.—PHIL., Abbild., iii, p. 38, pl. 8, f. 3.—REEVE, Conch. Icon., pl. 54, f. 355.—MARKTENS, Binnenmoll. Venezuela's, p. 177.

Resembles *A. midas*, a larger shell, in form of the aperture; but in coloration this species is similar to *A. euryomphalus*. The specimens before me are small (alt. 30, diam.  $15\frac{1}{2}$  mill.), heavily marked and with five whorls (fig. 47).

*A. DILLWYNIANA* Pfeiffer. Pl. 42, figs. 62, 63.

Shell perforate, ovate-oblong, solid; rudely striate and irregularly malleated, scarcely shining; fleshy, dotted and variegated with brownish. Spire convex-conic, the apex somewhat obtuse; suture impressed, margined. Whorls 5, slightly convex, the last a little longer than spire, attenuated and subcompressed at base.

Aperture slightly oblique, sinuose-oblong; peristome white, expanso-reflexed, the right margin lightly arcuate; columellar margin dilated above, nearly closing the perforation; columella with a strong twisted fold. Alt. 39, diam.  $16\frac{1}{2}$  mill. (*Pfr.*).

*Andes of New Granada* (Cuming coll.).

*Bulimus dillwynianus* PFR., P. Z. S., 1851, p. 258; Conchyl. Cab., p. 88, pl. 30, f. 25, 26; Monogr., iii, p. 372.

This species I have not seen. Compare *A. midas* var. *spectrum* Alb., which is similar in form and coloring; but Pfeiffer says *dillwyniana* is solid, rudely striate and irregularly malleated. The rather indefinite habitat assigned lies out of the range of other members of this group.

A. MIDAS Albers. Pl. 43, figs. 64-68.

Shell rimate-umbilicate, ovate, rather *thin*. *Fleshy-white, with long, oblique purple-brown stripes spotted with light*, and usually with *some scattered dark dots*, or else *red-tawny*, becoming lighter on the back and variegated with purple-brown there. *Surface smoothish*, the next-to-last whorl rib-striate, last whorl with faint growth-wrinkles and a microscopic superficial granulation. Spire varying in length; whorls about 5, slightly convex, the suture margined, at least on latter part of body-whorl. Last whorl not perceptibly compressed behind lip or pinched at base.

Aperture over half the alt. of shell, long-ovate, maculated within. Peristome white, the outer lip narrowly reflexed above, broadly below, *basal lip broadly reflexed* with recurved edge; columella with a long, low, spirally ascending fold above, separated from parietal wall by a shallow furrow. Parietal callus a mere transparent film.

Alt. 50, diam. 21; alt. of aperture, 29 mill. (type specimen).

Alt. 48, diam. 23; alt. of aperture, 27 mill.

Alt. 43, diam. 25; alt. of aperture, 28 mill.

*Puerto Cabello, Venezuela* (Swift).

*Bulimus midas* ALB., Zeitschr. f. Malak., 1852, p. 32.—PFR., Conchyl. Cab., p. 154, pl. 48, f. 17, 18; Monogr., iii, 331.—MARTENS, Binnenmoll. Venez., p. 177.

The typical form is slender, light colored with few dark oblique stripes and scattered dots (figs. 64, 65); others have much heavier marking (figs. 66, 67); and some specimens are a beautiful reddish color (fig. 68), with more or less dark marking on the back. The spire may be quite long and the figure of the shell slender (figs. 64, 67), or the spire may be short, body-whorl obese (figs. 66, 68). These variations are well connected by intermediate examples. Von Martens has referred this species to *Anthinus*, but it is very closely allied to *A. sinuatus*, and has no intimate relationship with *A. multicolor*, the type of *Anthinus*.

Var. SPECTRUM Albers. Pl. 43, figs. 69, 70.

Shell perforate, fusiform, rather thin, closely striate and submal-  
leate; tawny-flesh colored, with livid streaks and scattered chestnut dots. Spire long-conic, rather acute; suture somewhat margined. Whorls  $5\frac{1}{2}$ , rather convex, the last as long as spire, attenuated at base, and somewhat compressed.



Aperture subvertical, sinuate-elliptical; columella brownish-purple, with a strong oblique twist; peristome expanded and rather reflexed, the right margin somewhat sinuous, columellar margin spreading and vaulted over the umbilicus. (*Pfr. from spec. in coll. Albers*).

Alt. 43, diam. 15, alt. of aperture,  $22\frac{1}{2}$  mill.

"*New Granada*."

*Bulimus spectrum* ALB., Malak. Bl. i, 1854, p. 219.—PFR., Novit. Conch., i, p. 55, pl. 16, f. 3, 4; Monogr., iv, p. 441.

I regard this as a slender and rather small form of *A. midas*. The locality assigned must be viewed with suspicion. In *A. midas* the columellar fold is often colored, especially in immature examples.

*A. HAUXWELLI* CROSSE. Pl. 44, figs. 75, 76, 77, 78.

Shell openly rimate-perforate, fusiform, moderately solid. Tawny brown, variegated with wide longitudinal groups of *crowded, finely zigzag hydrophanous lines*. Surface lusterless, sculptured with low oblique rib-striæ on the antepenultimate whorl, the last whorl without distinct growth-striæ, *minutely, densely papillose*, the papillæ small, rather sharp and *irregularly scattered* (fig. 78, much enlarged). Spire conic, the apex very obtuse; whorls  $4\frac{1}{2}$ , slightly convex, the last slightly impressed behind the peristome, produced in a narrow rounded extension at base. Suture well impressed, somewhat descending toward its termination.

Aperture over half the alt. of shell, slightly oblique, very narrow and long; *produced in a rounded spout below*, flesh-colored within. *Peristome blackish-purple*, narrowly reflexed throughout, the outer lip somewhat sinuous. Columella widened above, the deeply entering fold gently convex.

Alt. 49, diam.  $18\frac{1}{2}$ ; alt. of aperture 29 mill.

Alt. 48, diam.  $18\frac{1}{2}$ ; alt. of aperture 29 mill.

*Near Pebas, on the Ambiyacu R., a tributary of the Amazon, Peru* (John Hauxwell!).

*Bulimus hauxwelli* CROSSE, Journal de Conchyl., xx, 1872, p. 211; xxi, 1873, p. 252, pl. 11, f. 2.—PFR., Monogr., viii, p. 109.

Through the courtesy of Prof. William B. Dwight, of Vassar College, I have been able to describe this species from the type and another specimen preserved in the museum of that college. The general contour is that of *A. distorta*, but the lip is narrow, as in *A.*

*goniostoma*. The hydrophanous zigzag lines are seen in no other species of *Auris*.

The minute papillose sculpture is the same as that of *A. midas*, but coarser. The spire is somewhat costulate, there is no trace of spiral sculpture, and the lip is sinuous; it therefore appears that *A. hauxwelli* is a member of the group of *A. distorta*, rather than of the *A. goniostoma* group in which there is distinct spiral sculpture, non-costulate and longer spire, and the lip is not sinuous.

*A. hauxwelli* is one of the most peculiar and beautiful species of the family *Bulimulidæ*.

#### Subgenus GONYOSTOMUS Beck, 1837.

(= *Gonyostomus* or *Goniostomus* plus *Anthinus* Alb. For references see p. 96).

Shell rimate-umbilicate, fusiform or ovate-conic, with 5-5½ gently convex whorls. *Surface finely granose spirally*. Aperture elliptic or ovate, angled above, rounded below, or angular at base also; the peristome *evenly, narrowly expanded or reflexed*; outer lip *evenly arcuate*, not sinuous, with *no internal callous projection*; columellar lip free, inserted high, the columella with a deep-seated and weak fold. Type *A. goniostoma*.

Distribution, south-eastern Brazil.

*Gonyostomus* differs from *Eudolichotis* in the system of sculpture and in having an evenly arcuate peristome, in a level plane, the lip neither sinuous nor with callous thickenings within. The union of *A. goniostoma* with the *distorta* group, and of *A. perdix* and *midas* with *A. multicolor*, on account of the angulation or roundness of the bases, is a thoroughly unnatural grouping. *A. multicolor* is closely allied to *hybrida* and *goniostoma* in sculpture, color, texture, and characters of the aperture, while *A. perdix* and *midas* are closely connected with the *distorta* group by intermediate species. Both *Eudolichotis* and *Gonyostomus* include species with angular and species with rounded bases. This feature is no more a group character in Bulimoid shells than the angulation of the periphery is in Helices; and the reference of all forms having the base angular to one subgenus is as artificial an arrangement as the Lamarckian "genus" *Caracolla* for all keeled Helices.





*Key to species of Gonyostomus.*

- I. Shell fusiform, base angular; aperture with a basal channel.
  - a. Unicolored chestnut; granulation fine, *goniostoma*.
  - aa. Striped and maculated with yellow, more coarsely granulated, *hybrida*.
- II. Shell ovate-conic, base rounded; aperture rounded below.
  - a. Opaque whitish and dark brown, streaked, dotted and maculated, *multicolor*.

## A. GONIOSTOMA Férussac. Pl. 43, fig. 76.

Shell rimate-umbilicate, *fusiform*, solid, *chestnut-brown*. Surface finely, irregularly striate longitudinally, and encircled by close, unequal, spiral series of minute granules. Spire long, the apex obtuse. Whorls 6, gently convex, separated by oblique sutures, *the last whorl compressed and angular at base, the umbilical region excavated*.

Aperture less than half the alt., elliptical, *angular above and below*, whitish or livid within. Peristome very narrowly reflexed throughout, rose color or white; *basal margin produced, angular and channelled*; columella margin concave, with a low entering fold above; parietal wall bearing a white callus between the lip ends, livid within.

Alt. 56, diam. 18½–21 mill. (specimens).

Alt. 60, diam. 19 mill. (Pfr.).

*Macahe (Paz), and Rio Janeiro, Brazil.*

*Helix (Cochlogena) goniostoma* FER., Prodr., p. 57, No. 441 (founded on . . . . . MAWE, Travels in the Interior of Brazil, 1812, third plate of Appendix, fig. 3; and with a "?," Lister, pl. 1059, f. 4 [= *Glandina truncata*]).—WOOD, Index Test. Suppl., pl. 7, f. 24b.—*Bulinus goniostoma* SOWB., Zool. Journ., i, 1825, p. 59, pl. 5, f. 2.—DESH. Lam., An. s. Vert. viii, p. 249, and in Fér., Hist., p. 105, pl. 143, f. 9, 10.—POT. & MICH., Galerie, i, p. 141, pl. 14, f. 17, 18.—PFEIFFER, Conchyl. Cab., p. 21, pl. 5, f. 1, 2; Monogr., ii, p. 50 (excl. var.).—REEVE, Conch. Icon., pl. 34, f. 206.—*Pupa goniostoma* GRAY.—*Gonyostomus gonyostoma* BECK, Index, p. 53.—*Goniostoma erubescens* SWAINS, Malacol., p. 177, 335, f. 25.

This well-known species is unmistakable, its only near ally being the next species, with which it was formerly united. The smallest fully adult specimen I have seen is 49 mill. long. The only varia-

tion of consequence is in the color of the peristome, which may be either white or rose.

A. HYBRIDA Gould. Pl. 43, fig. 75.

Shell rimate-umbilicate, fusiform, like *A. goniostoma* in shape. Dark or purple-brown, variegated with oblique flames and irregular spots of yellow. Surface sculptured with conspicuous close and unequal spiral series of granules, and often superficially malleated. Whorls  $5\frac{1}{2}$ –6, the last keeled at base, excavated in umbilical region.

Aperture elliptical, angular at both ends, channelled at base, dull purple within; peristome narrowly reflexed throughout, rose colored, or with the outer lip white.

Alt. 46, diam. 17 mill.

Alt. 41, diam. 15 mill.

Brazil, around Rio Janeiro (U. S. Expl. Exped.), and in Organ Mts.; Macahé (Paz and Martinez).

*Bulimus egregius* PFR., P. Z. S., 1845, p. 67 (not of Jay, 1836); Monogr., ii, 50; iii, p. 372.—GOULD, Otia Conch., p. 244; U. S. Expl. Exped., Moll., p. 77, pl. 6, figs. 86, 86a.—REEVE, Conch. Icon., pl. 34, f. 205.—DESH. in Fér., Hist., p. 104, pl. 143, f. 7, 8.—*Bulimus hybridus* GLD., Proc. Bost. Soc. N. H., ii, p. 191 (Dec., 1846); Otia Conch., p. 32.—HIDALGO, Viaje al Pacif., p. 76.—PFR., Monogr., iv, p. 440.

The form is that of *A. goniostoma*, but the granulation is coarser and more irregular, and it is conspicuously marked with yellow. In size it is somewhat less than *goniostoma*.

A. MULTICOLOR Rang. Pl. 43, figs. 73, 74.

Shell rimate-umbilicate, ovate-conic, rather solid. Irregularly striped or maculated in ragged pattern with purple-brown on an opaque white or olive clouded white ground, the dark streaks generally dotted with white. Surface shining, densely sculptured with spirally arranged granules, at least on the spire. Apex obtuse; whorls  $5\frac{1}{2}$ , convex, separated by impressed and narrowly margined sutures, the last whorl ovate, rounded below.

Aperture somewhat over half the shell's length, oblong-oval, rounded below, dark violet within. Peristome rather narrowly ex-



panded, rose colored; parietal callus and the weak columella fold, white.

Alt. 35, diam. 16; alt. of aperture 19 mill.

Alt. 33, diam.  $16\frac{1}{2}$ ; alt. of aperture 18 mill.

*Rio Janeiro, Brazil* (J. G. Anthony); *Macahe* (Paz).

*Helix multicolor* RANG, Ann. Sci. Nat., 1831, p. 55, pl. 3, f. 1.—*Bulinus multicolor* SOWB., Conch. Illustr., f. 89.—KING, Zool. Journ., v, p. 341.—*Bulinus multicolor* PFR., Monogr., ii, p. 42; iii, 332; Conchyl. Cab., p. 22, pl. 5, f. 3, 4.—REEVE, Conch. Icon., pl. 39, f. 238; Conch. Syst., ii, pl. 174, f. 89.—DESH. in Lam., An. s. Vert. viii, p. 239; and in Fér., Hist., p. 40, pl. 145, f. 1, 2.—*Gonyostomus multicolor* BECK, Index, p. 53.

A well known shell, allied to *A. hybrida*, but rounded at base, with more elaborate color pattern and finer, less pronounced granulation.

Var. *MIERSII* Sowerby. Pl. 43, figs. 71, 72.

Similar to *A. multicolor*, but slightly more slender, with the spire higher, mouth proportionally shorter; body-whorl corneous-brown in the middle, purple-brown above and below, with the usual opaque-white markings, the whorls of spire dark above, light below. Alt.  $40\frac{1}{2}$ , diam. 19; alt. of aperture 22 mill. Sometimes smaller: alt. 34 mill., with the same proportions.

*Rio Janeiro, Brazil* (Anthony, Paz).

*Bulinus miersii* SOWB., Conch. Illustr., f. 90.—*Bulinus miersii* REEVE, Conch. Syst., ii, pl. 174, f. 90 (printed from Sowerby's plate); Conch. Icon., pl. 39, f. 239.—PFR., Conchyl. Cab., p. 146, pl. 45, f. 20, 21; Monogr., iii, p. 333.—DESH. in Fér., Hist. pl. 130, f. 7, 8.—*B. multicolor* var. PFR., Monogr., ii, p. 43.

I see no sufficient grounds for separating this specifically from *A. multicolor*.

## Genus BULIMULUS Leach, 1815.

*Bulimulus* LEACH, Zool. Miscellany, i, p. 41 (for *B. acutus* and *B. trifasciatus* Leach, = *Helix exilis* Gmel.).—V. MARTENS in Die Binnenmoll. Venezuela's, p. 21 (1873); Biol. Amer. Cent., p. 238 (1895).—SEMPER, Reisen in Archipel der Philippinen, Land-moll., iii, p. 153.—*Bulimulus* s. g. *Orthotomium*, FISCHER & CROSSE, Miss. Sci. Mex. Moll., i, p. 473 (1875).

Shell varying from ovate-conic to oblong, columnar or lanceolate; umbilicate or imperforate; aperture with the lip thin, generally not expanded; columella expanded, rather straight, sometimes with a callous fold within. Apical whorls either smooth, vertically costulate or wrinkled, or with the wrinkles interrupted and broken into granules; *never sculptured with spiral and vertical raised striæ forming a minute grating.*

Radula substantially as in the normal, terrestrial Helicidæ.

Jaw composed of rather few plates with vertical, narrowly free lateral edges not sufficiently converging to form a triangular area of shorter plates in the middle.

Genitalia without accessory organs or appendages.

Type *Bulimulus exilis* (Gmelin).

DISTRIBUTION: Warm temperate and tropical America, from Argentina and Chili north to Arkansas and Tennessee. No species of *Bulimulus* occur in the Eastern Hemisphere, although several genera, such as the Australian *Liparus*, and *Placostylus*, a group of the Melanesian tract, are closely allied to American genera.

The species of *Bulimulus* live by preference on the ground or on low herbage or shrubs. Hybernation or æstivation usually takes place in the soil, but they sometimes æstivate on bushes during dry weather.

*Bulimulus* is here used in the sense in which it has been understood by von Martens in his several references to the genus since 1873. This is a narrower meaning than the ordinary usage, and practically equivalent to *Orthotomium* of Crosse and Fischer. It is closely allied to DRYMÆUS (= *Otostomus* Martens, not of Beck as restricted by Gray and Herrmannsen), but differs in the Helicid character of the teeth, and to a less extent in the fewer, wider, less converging ribs of the jaw. The shells differ in the system of sculpture of the apical whorls, which in *Drymæus* show a very fine grating formed by the intersection at right angles of vertical and spiral



striae, in the vast majority of species; but in a few there are spirals, without distinct grated pattern. *No BULIMULUS has this type of apical sculpture.*

It is, therefore, possible to ascertain the generic position of any specimen in which the apex is unworn, from the shell alone, if a lens of high power be used in the examination. The exceptions to this statement being extremely few in number, so far as my observations extend. On the other hand, it is frequently impossible to decide with certainty the position of species which one may know only by descriptions and figures, since these do not, in most cases, afford the requisite information upon the minute sculpture of the apices. In the grouping of such forms in this work, the general features of the shell have served as a guide, but it must be expected that further examination of specimens will result in a certain number of transpositions and exchanges of species between the genera *Bulimulus* and *Drymæus*.

*Bulimulus* differs from *Plekocheilus* and *Auris* mainly in the simpler shell, without the modifications of lip and columella characteristic of those genera.

CLASSIFICATION. *Bulimulus* has been subdivided into a large number of subordinate groups, based upon the contour and texture of the shell. The subgenera so formed are in many cases neither consistent geographic groups, nor are the characters of shell-contour upon which they are grounded, correlated with anatomical distinctions. It is here proposed to abandon the divisions founded upon these characters, and to substitute a classification based primarily upon *the sculpture of the nepionic or apical whorls*. This feature is in most species readily observable in adult specimens with a lens of ordinary power; and the examination of extensive series shows it to be remarkably and to an unexpected degree constant throughout large groups of species. The groups indicated by the several types of embryo sculpture are confirmed by the anatomical characters, so far as these are yet known, and they are in every case which has come under my observation, consistent geographically.

In course of the development in this volume and the one to follow, of the system outlined below, it will be observed that in many cases a series of species "parallel" in contour, texture and general aspect recurs in each of the main divisions of the genus. Thus the groups *Peronæus* (Chili, Peru), *Pleuropyrgus* (Galapagos) and *Plicolumna* (Lower California) are very similar in their narrow, long contour,

and were formerly brought together; but a study of the apical whorls shows that each of these groups is a special "parallel" modification of different *Bulimulus* stocks of ordinary form inhabiting each of these regions, and it becomes clear that they are totally independent and unrelated groups, with an origin and past history different in each case. Again, an adequate study of specimens will, in my opinion, convince conchologists that the similarity in appearance between Chili-Peruvian and northern Mexican forms of the *B. proteus*, *erythrostomus*, *schiedeanus* and *montezuma* groups, is not evidence of close relationship but merely of similar environments. It is unnecessary in this place to multiply instances of such parallelism in the Bulimi.

*Primary divisions of Bulimulus.*

- I. *Apical whorls smooth, not wrinkled, costate or granular.* Species of Ecuador, Peru, Chili, Bolivia and Argentina.
- II. *Apical whorls irregularly wrinkled subvertically, or with the wrinkles wavy, dislocated or variously broken into granules.* Species of Tropical America, West Indies and Galapagos Is.
- III. *Apical whorls with regular, straight vertical riblets.* Species of northern Mexico, Lower California and the southern United States.

The first of these groups consists of the single subgenus *BOSTRYX*, including several "sections" of little systematic worth.

The second contains several subgenera (see *Nautilus* ix, 114, and the next volume of this work).

The third forms the subgenus *ORTHOTOMIUM*, with two "sections," *Sonorina* (n. n. for *Leptobyrsus*) and *Plicolumna*.

I. Subgenus *BOSTRYX* Troschel, 1847.

= *Bostryx* Trosch. + *Peronæus* Alb. + *Ataxus* Alb. + *Pyrgus* Alb. + *Scutalus* Alb. (larger part), + *Temesa* Ads.

Shell varying from obese (or Helicoid) to slender and columnar or subulate; umbilicate or imperforate, more or less opaque and calcareous, sometimes corneous-streaked. *Apical whorls smooth* and glossy, without sculpture of any kind. Aperture ovate or angular,



the outer lip unexpanded or expanded, columellar lip dilated above.

Distribution of typical forms, Chili, Peru, adjacent part of Bolivia and Ecuador, the Andean highland and the Pacific slope; a group of thin-shelled species, part of them doubtfully referable to this genus, extends eastward across Bolivia and Argentina.

*Bostryx*, in the enlarged sense herein proposed, forms a compact, readily recognized subgeneric group, well distinguished by the smooth and frequently rather teat-like apex, more or less calcareous texture, and unexpanded or but little expanded lip. It is an equally compact group geographically, being confined to the elevated Andean region of Peru, Bolivia and Chili and its western slope to the Pacific, with some species in Argentina. To the north and northeast other and distinct groups of *Bulimulidæ* completely replace *Bostryx*.

Although the variation of contour is greater within this subgenus than in any other group of *Bulimulidæ*, the series of species is really not markedly discontinuous, as intermediate forms still existing largely bridge the spaces between the several extremes of divergence. *The subdivisions used below are, therefore, groups of but slight systematic value, and might well be dispensed with were it not that it seems convenient to divide a subgenus so numerous in species.*

*Key to sections of Bostryx.*

- I. Shell wider than high, with depressed spire and broad, conic umbilicus *Platybostryx*, p. 129.
- II. Shell higher than wide, the spire elevated.
  - a.* Umbilicus large and tubular, *Ataxus*, p. 130.
  - aa.* Umbilicus small or imperforate.
    - b.* Dextral; sutures very deep; last whorl free from preceding, or only in contact for a short distance at aperture; whorls somewhat angular, *Bostryx*, p. 133.
    - bb.* Sinistral; slender and elongated, *Temesa*, p. 134.
    - bbb.* Dextral; whorls not angular, nor with a tendency to become free.
      - c.* Column-shaped, narrow; whorls 15-20, *Geoceras*, p. 136.
      - cc.* Whorls 11 or fewer.

- d. Shell narrow, Melania-shaped, regularly tapering; subimperfurate; columella subtruncate, *Geopyrgus*, p. 135.
- dd. Shell narrow and elongated, convexly tapering, perforate, *Peronæus*, p. 138.
- ddd. Shell with obese body-whorl, umbilicate or perforate, *Lissoacme*, p. -

Section 1. PLATYBOSTRYX Pilsbry, 1896.

Wider than high, with broad, crater-shaped umbilicus; the top flattened with mamillar apex, the last whorl acutely keeled at periphery and base.

B. EREMOETHAUMA Pilsbry, n. n. Pl. 44, figs. 83, 84, 85, 86.

Shell wider than high, with a *broad crater-shaped umbilicus, acutely carinated periphery and base, low spire, and descending last whorl*. White, or with flesh-colored suffusion in places; solid but thin, calcareous. Surface lusterless, rudely wrinkle-striate above, the wrinkles cut and festooned by a group of spiral incised striæ; the lower surface vertically, irregularly plicate, and often with some short transverse wrinkles. Spire low-convex, *the apex mamillar, projecting, smooth*. Whorls  $4\frac{1}{2}$ , rapidly widening, the latter two concave above; last whorl with very acute, pinched peripheral and basal keels; its latter third or half deeply descending.

Aperture white or brownish inside, subtriangular, oblique, angular above, and acutely so at positions of outer and basal keels; peristome continuous, in contact with preceding whorl at its upper angle only; upper margin simple, outer slightly expanded, columella margin arcuate and expanded.

Alt. 10, diam. 14 mill. (type).

Alt. 11, diam. 12 mill. (Hidalgo).

*Cachinal de la Costa* (Phil.); *Paposo* (Phil., Paz.), *Desert of Atacama, Chili*, under stones and among the roots of plants.

*Helix reentsii* PHIL., *Anales de la Univ. de Santiago*, 1855, p. 213; *Malak. Bl.*, 1856, p. 52, 152; *Reise durch die Wüste Atacama*, 1860, p. 182, pl. 7, f. 8.—PFR., *Monogr.*, iv, p. 182.—HIDALGO, *Moluscos del Viaje al Pacifico*, p. 22, pl. 1, f. 4-5.—Not *Bulimus reentsi* Phil., 1851.

Hidalgo records a form measuring, alt. 9, greater diam. 15, lesser 13 mill.; spire flat, last whorl less descending, umbilicus wider, peristome more adnate.



This species is so excessively peculiar that comparisons with other forms would be superfluous. The specific name given by Philippi is preoccupied for another species belonging to *Lissoacme*, a closely allied section of this genus. This duplication arose from the reference of the present form to the genus *Helix*.

Section 2. ATAXUS Albers, 1850.

*Ataxus* ALB., Die Hel., p. 164 (only species *B. umbilicaris* Soul.).

Shell elongated, ovate-conic or subfusiform, with numerous (7-9) rather flattened whorls; umbilicus very large, deep and well-like, with subperpendicular walls; aperture small. Type *B. umbilicaris* Soul.

Distribution, northern Chili and Andean plateau of Peru.

*Key to species of Ataxus.*

- a. Shell smooth or nearly so, conic; umbilicus extremely large,  
*umbilicaris*.
- aa. Shell striated, fusiform; umbilicus smaller.
  - b. Aperture over one-third the alt. of shell, *infundibulum*.
  - bb. Aperture less than one-third the alt. of shell,  
*umbilicatellus*.
- aaa. Surface of shell ribbed.
  - b. Surface costulate,  
*tubulatus*.
  - bb. Surface distantly ribbed, like a *Scalaria*,  
*scalaricosta*.

B. UMBILICARIS Souleyet. Pl. 44, figs. 87, 88.

Shell with *ample, well-like umbilicus*, long-conic; thin but rather solid; opaque, white or flesh-tinted; smooth except for slight growth-lines usually indistinctly crimped in spiral order, shining. Spire attenuated above, the earlier whorls smooth, corneous, mamillar. Whorls 7, slightly convex, regularly widening, the last not deflexed, narrowed toward the base, forming a narrowly rounded ridge around the very large umbilicus, which penetrates well-like to the apex.

Aperture small, oblique, *narrowly oblong*; peristome white, sub-continuous, in contact with the body-whorl only for an *extremely short distance* above; outer and basal lips narrowly expanded, columellar lip straighter, dilated.

Alt. 15, diam. 7 mill.; alt. of aperture 6.6 mill.

Alt. 14.3, diam. 6 mill.; alt. of aperture 5 mill.

Alt. 12.7, diam. 7 mill.; alt. of aperture 5 mill.

*Cobija, northern Chili.*

*Bulinus umbilicaris* SOUL., Rev. Zool., 1842, p. 102; Voy. Bonite, Zool., ii, p. 513, pl. 29, f. 12-15.—PHIL., Abbild. u. Beschreib., ii, p. 11, pl. 3, f. 7.—REEVE, C. Icon., pl. 66, f. 460.—DESH. in Fér., Hist., p. 74, pl. 145, f. 7-9.—PFR., Conchyl. Cab., p. 84, pl. 30, f. 21, 22; Monogr., ii, p. 97; vi, 80.—*B. infundibuliformis* JAY, Ann. Lyc. Nat. Hist. New York, iv, p. 169, pl. 10, f. 7 (1848).

The very large, well-like umbilicus, is the most striking feature of this well known species.

*B. INFUNDIBULUM* Pfeiffer. Pl. 44, figs. 89, 90, 91, 92.

Shell umbilicated, ovate-conic, somewhat fusiform; closely striated, opaque; white (either uniform, or streaked with tawny, or one-banded with ashen). Spire convex-conic, the apex attenuated, roseate, rather acute; suture linear. Whorls 9, nearly flat, the last about three-sevenths the length of shell, attenuated at base, compressed around the broad, penetrating, funnel-shaped umbilicus.

Aperture subvertical, narrow, oblong; peristome simple, the margins approaching above; right margin narrowly expanded, columellar margin rather dilated. Alt. 18, diam. 7 mill.; aperture 8 mill. long, 3 wide. (*Pfr.*).

*Huanta and Pucra, Prov. of Ayacucho, Peru.*

*Bulinus infundibulum* PFR., P. Z. S., 1851, p. 255; Conchyl. Cab., p. 85, pl. 30, f. 19, 20; Monogr., iii, p. 375 (1853).—MORELET, Sér. Conch., iii, p. 204, pl. 11, f. 6.

This curious species, allied to *B. umbilicaris* of Bolivia, inhabits the elevated country between the vallies of Abancay and Ayacucho, occurring on grass in stony places. The specimens collected at Huanta are generally 18 mill. long, corresponding to Pfeiffer's description. Those from Pucra, a colder locality, attain the size of 23 by 5½ mill. The form streaked with tawny also occurs at this place. (*Morelet*).

*Var. umbilicatellus* Pilsbry. Pl. 44, figs. 93, 94.

Allied to *B. infundibulum*, but form slenderer, umbilicus decidedly narrower, and aperture shorter. White, becoming bluish on the spire, several of the earlier whorls deep purple-brown. *Surface sculptured with rather close, distinct striæ*, which become more separated and irregular on the last whorl, and are absent on the first two. Whorls 8½, rather convex, the last compressed at base, angular around the narrowly funnel-shaped umbilicus.



Aperture somewhat less than one-third the length of shell, light brown within, twice as high as wide, narrow, and angular at both ends; peristome sharp and simple, the outer lip unexpanded, columellar lip long, slightly dilated above. Alt.  $17\frac{1}{2}$ , diam. 6 mill.

Peru.

*B. TUBULATUS* Morelet. Pl. 44, figs. 95, 96.

Shell umbilicated, conoid-turritid, solid, arcuately and distantly costulate, scarcely shining, white. Whorls 9, slightly convex, the last slightly over one-third the length of shell, much compressed at base, angulated around the wide, perspective umbilicus.

Aperture narrow, oblong, biangular, pale tawny within; margins simple, approaching and joined by a callus, the upper straight, columellar narrowly spreading. Alt. 19, diam. 6 mill. (Mor.).

Valley of Andahuaylas, Peru, on grassy slopes (Angrand).

*Bulimus tubulatus* MOREL., Journ. de Conch., viii, 1860, p. 375.—PFR., Monogr., iv, p. 121.—*B. tnbulatus* MOREL., Sér. Conch., iii, p. 204, pl. 11, f. 4.

This shell looks like *B. infundibulum*, but is at once distinguished by the sculpture. Instead of being smooth like *umbilicaris*, or densely covered with striæ as in *infundibulum*, it is ornamented with little projecting, regular, spaced ribs, with no striæ in the intervals. The amplitude of the umbilicus and shortening of the aperture separate it moreover from the second of these species, with which its relationship is more intimate. The shell is solid, whitish, without luster, the earlier whorls corneous and transparent. (Morel.).

*B. SCALARICOSTA* Morelet. Pl. 44, figs. 97, 98.

Shell umbilicated, fusiform-turritid, rather solid, strongly and distantly ribbed; lusterless, dull white. Spire turriculated, pale corneous toward the apex. Whorls 9, nearly flat, lightly coarctate in the middle, the last whorl nearly a third the total length, compressed at base, with a crenulated angle around the wide and deep umbilicus.

Aperture narrow, oblong, pale tawny inside; peristome continuous, simple, the upper margin unexpanded, columellar margin slightly spreading. Alt. 15, diam. 5 mill. (Morel.).

Plateau of Andamarca, Prov. Cuzco, Peru (Angrand).

*Bulimus scalaricosta* MOREL., Journ. de Conch., viii, 1860, p. 375; Sér. Conch., iii, p. 205, pl. 11, f. 8.—PFR., Monogr., vi, p. 139.

This shell belongs to the same group as the preceding, but differs in certain particulars. The most noticeable is the ornamentation of the surface, which consists of elevated distant, curved ribs, like those of a *Scala*. These ribs begin on the third whorl, the summit being smooth and corneous. Very pronounced at the beginning, the ribs enlarge and become wider spaced with the increase of the shell, are continued into the umbilical cavity and persist to the extreme limit of the shell. The intercostal spaces have lower, finer riblets. Another differential character is the form of the aperture. Not only is the cavity narrower than in other species of this group, but the margins are united above, as though the peristome were continuous. The outer lip is narrow; it surpasses the columellar margin, the dilation of which is very weak, sometimes almost absent. Umbilicus strictly analogous to that of *tubulatus* and *infundibulum*. The whorls of the spire also have a peculiarity; the earlier are rounded, but little by little the convexity diminishes, and toward the middle a contraction becomes quite noticeable. This causes a sort of indistinct bulging below the sutures, which gives the spire a turriculate appearance. (*Morel*).

Section 3. *Bostryx* Troschel (s. str.), 1847.

*Bostryx* TROSCHEL., Zeitschr. f. Mal., 1847, p. 49 (April, 1847), type and sole species *B. solutus*.

Shell turritid, higher than wide, rugose, *the last whorl or two either free, not in contact, or separated by very deep sutures*. Aperture small, squarish-oval, subvertical; umbilicus inconspicuous. Type *B. solutus* Troschel.

*B. SOLUTUS* Troschel. Pl. 44, figs. 99, 1, 2.

Shell turritid, rather thin, rugose; ashen, usually two-girdled with chestnut. Spire turritid, the apex rather obtuse. Whorls 6, the upper four regularly in contact, *the latter two completely free, not in contact*, the right side above and the base keeled, the keel bordered by an impressed line on each side.

Aperture subvertical, oblong-tetragonal (or quadrangular), the angles of left side rounded; peristome simple, straight, continuous. Alt. 12, diam.  $5\frac{1}{2}$  mill.; aperture, alt. 4, width 3 mill. (*Pfr.*).

*Peru* (Dr. v. Tschudi).

*Bulimus (Bostryx) solutus* TROSCHEL., Zeitschr. f. Mal., 1847, p. 49; Archiv für Naturg., 1849, i, p. 233, pl. 4, f. 5 (dentition); and 1852,



i, p. 195, pl. 5, f. 6 (shell).—PFR., Monogr., ii, p. 161; iii, 403; iv, 462; vi, 101.—*B. solutus* REEVE, Conch. Icon., pl. 75, f. 540.

About twenty specimens collected, all of the same form. The young shells with four whorls resemble an obese *Bulimus* with narrow umbilicus; subsequent whorls become free and two-keeled. With the exception of the first smooth whorls, the shell is roughened by rather coarse and irregular longitudinal wrinkles.

*B. HOLOSTOMA* Pfeiffer. Pl. 44, fig. 3.

Shell small, *rimate-umbilicate*, very *narrowly cylindric-tapering*, rather thin; fleshy-ashen. Surface lusterless, sculptured with *very coarse unequal and irregular fold-like ribs*. Spire slowly tapering, the apex very obtuse, upper  $1\frac{1}{2}$  whorls rounded, glossy, corneous and smooth; following whorl weakly plicate, becoming somewhat shouldered; the remaining whorls more or less flattened at periphery, *subangular* above and below; *the sutures very deeply constricting*.

Aperture small, contained about  $4\frac{1}{2}$  times in length of shell, squarish-oval; *peristome continuous*, very shortly free, slightly thickened at position of contact with preceding whorl, and with the columellar margin a trifle expanded.

Alt. 8, diam. 2.8 mill. (Specimen).

Alt. 9, diam.  $2\frac{2}{3}$  mill. (Pfr.).

*Cobija, Chili (Paz).*

*Bulimus holostoma* PFR., P. Z. S., 1846, p. 28; Monogr., ii, p. 161.—REEVE, Conch. Icon., pl. 69, f. 490.—HIDALGO, Journ. de Conch., 1870, p. 56.

This form differs from *B. scalaricosta* and *tubulatus* in the restriction of the umbilicus to a narrow perforation, and in the very deep sutures. This last character, with the blunt angulation of the whorls, allies it to *B. solutus*.

Section 4. *Temesa* H. & A. Adams, 1855.

*Temesa* ADS., Genera Recent Moll., ii, p. 175, for *australis* Forbes, *clausilioides* Rve., *funcki* Pfr., *glorifica* Parr., *livida* Mke.—O. SEMPER, Journ. de Conchyl., 1866, p. 42, restricted to *australis* Forbes, *clausilioides* Rve., *funcki* Pfr.—FISCHER, Man. de Conchyl., p. 483, *clausilioides* mentioned as an example.

Shell sinistral, much elongated and narrow, perforated, with numerous (9) whorls; aperture squarish, the lip simple. Type *B. clausilioides* Reeve.

The single species is anatomically known, and its relationships are uncertain. *Temesa* has hitherto been associated with *Balea*, and as originally proposed contained species of *Perrieria* and true *Clausilia*, besides the Peruvian form now regarded as type of the group.

B. CLAUSILIOIDES Reeve. Pl. 45, fig. 4.

Shell sinistral, elongately turritid, somewhat cylindrical, compressly umbilicated. Whorls 9, obscurely ribbed around the upper part, longitudinally very closely and very minutely roughly striated. Columella vertically reflected. Aperture somewhat square, the lip simple. Mouse colored. Alt.  $13\frac{1}{2}$  mill. (Reeve).

*Andes of Caxamarca, Peru*, (W. Lobb).

*Bulimus clausilioides* REEVE, Conch. Icon., pl. 73, f. 523 (July, 1849); P. Z. S., 1849, p. 96.—?? *Balea clausilioides* PFR., Monogr., iii, p. 584; Conchyl. Cab., p. 145, pl. 17, f. 34–37.—*Temesa clausilioides* H. & A. AD., Gen. Rec. Moll., ii, p. 175 (1855).—PFR.-CLESS., Nomencl. Hel. Viv., p. 364.

This species does not seem to be allied to *Balea* (*Temesa*) *funcki* Pfr. (Monogr., ii, p. 389), but to the narrow Peruvian Bulimuli, from which it apparently differs mainly in being sinistral. It is known to me from the figure and description only.

The figures in the Conchylien Cabinet do not seem to me to represent the same species.

#### Section 5. *Geopyrgus* Pilsbry, 1896.

*Geopyrgus* PILS., Nautilus, ix, p. 114 (Feb. 1, 1896).—*Pyrgus* ALB., Die Hel., 1850, p. 177. Not *Pyrgus* Hübner, 1816.

Shell high, turritid, *regularly tapering*, with many slowly widening whorls; the *umbilicus a mere chink* behind the *reflexed and appressed* columellar lip; outer lip not expanded. Type *B. turritus* Brod.

B. TURRITUS Broderip. Pl. 45, fig. 5.

Shell *turritid*, *Melania*-shaped, solid, opaque and calcareous; whitish, often pinkish above, with *four spiral chestnut bands*, one bordering the suture, two peripheral and one basal, the latter concealed on the spire; apex purplish. Surface shining, smooth, growth-lines rather faint. Spire *regularly tapering*, the apex obtuse. Whorls 9–10, weakly convex, very regularly and slowly widening, the last convex. Umbilicus a mere chink.



Aperture small, oblique, irregularly oval, the outer lip regularly arcuate, simple; columellar lip *reflexed, dilated and appressed above*. Columellar margin vertical, making an angle with parietal wall, which bears a slight film of callus. Alt.  $18\frac{1}{2}$ , diam. 7 mill.; sometimes narrower.

*Mountains near Trujillo, Peru* (Cuming).

*Bulinus turritus* BROD., P. Z. S., 1832, p. 106.—SOWB., Conch. Illustr., f. 31.—*Bulimus turritus* DESH., in Lam. An. s. Vert., viii, p. 275.—REEVE, Conch. Icon., pl. 20, f. 124.—PFR., Monogr., ii, p. 178; vi, p. 118.

The closely reflexed and appressed columellar margin leaving but a narrow chink-like perforation, and the regularly tapering spire are characteristic. In young shells the columellar reflexion is shorter. The bands are often more or less interrupted into spots; the basal band is wider; and there is occasionally a short fifth band immediately at the base. Some specimens are larger than above indicated, alt. 26, diam.  $7\frac{1}{2}$  mill.

The only known locality for this species lies considerably north of the range of other slender *Bostryx* forms.

#### Section 6. *Geoceras* Pilsbry, 1896.

Shell cylindrical or column-shaped, long (the diam. less than one-fifth the alt. in known species), imperforate or nearly so, with many (16–19) narrow whorls, the base of the last defined by an angle or keel. Aperture small, the outer lip unexpanded, columellar lip somewhat dilated, appressed. Type *B. columellaris* Reeve.

A group of the Peruvian Andes, somewhat resembling *Holospira* in the narrow and numerous whorls.

#### B. COLUMELLARIS Reeve. Pl. 45, fig. 6.

Shell imperforate, *cylindrical*, rather solid, obliquely striatulate, shining; bluish flesh-color. Spire long. *Whorls 17*, slightly convex, the first 7 forming a cone with rather acute, corneous apex, the rest of the whorls subequal; *last whorl one-sixth the length of shell*, obtusely carinated below the middle.

Aperture little oblique, subtetragonal-oval; peristome simple, unexpanded, the columellar margin reflexed and adnate. Columella somewhat twisted. Alt. 33, diam. scarcely 6 mill.; aperture 6 mill. long. (*Pfr.*).

*Andes of Caxamarca* (=Catamarca), under stones, 12,000 ft. alt. (W. Lobb); *on the Apurimac River, 70 leagues from Cocabambilla*, at bases of cacti growing in rock crevices (Angrand).

*Bulimus columellaris* REEVE, P. Z. S., 1849, p. 100; Conch. Icon., pl. 73, f. 528.—PFR., Monogr., iii, p. 403.—MORELET, Ser. Conch., iii, p. 211.—*Carelia columellaris* PFR., *olim*; *Spiraxis columellaris* PFR., Monogr., iv, p. 572; Nomencl. Hel. Viv., p. 323.—*Subulina columellaris* H. & A. Ad., Gen. Rec. Moll., p. 111.—*Macroceramus* (*Anoma*) *columellaris* MART., Die Hel. (2), p. 270.

*B. CUSPIDATUS* Morelet. Pl. 45, fig. 7.

Shell imperforate, *cylindrical*, smooth, whitish, obliquely streaked with reddish. Spire elongated, forming an acute cone above. *Whorls 16, scarcely convex*, the last scarcely wider than the penultimate, with close, sometimes confluent streaks, and obtusely angular below the middle.

Aperture small, oblong, subangular; peristome simple, unexpanded; columellar margin very narrowly dilated and appressed. Columella nearly straight, narrow. Alt. 30, diam. 5 mill. (*Morel.*).

*Banks of Apurimac River at Cocabambilla and in the gorges of Chachapoyas*, at the bases of cacti of the genus *Cereus* (Angrand).

*B. cuspidatus* MOREL., Ser. Conch., iii, p. 210, pl. 11, f. 7 (April, 1863).—PFR., Monogr., vi, p. 91.—*Rumina* (*Obeliscus*) *cuspidatus* PFR.—CLESS., Nomencl. Hel. Viv., p. 318.

This species is one of a peculiar group, confined to Peru, and resembling *Cylindrella* except in the aperture. The 7 or 8 earlier whorls form an acute cone; the rest are of nearly equal caliber, forming a cylinder; on the last there is an obtuse angle which is obsolete on the latter part. The surface appears smooth and shining, but with a lens superficial growth-striæ are readily seen.

*B. VERUCULUM* Morelet. Pl. 45, fig. 8.

Shell subimperforate, cylindrical, arctispiral, rather thin and smooth, shining, corneous-white, generally banded with reddish. Spire long, perceptibly tapering, brownish above. Whorls 19, nearly flat, *the last carinated, the base flat or concave*.

Aperture ovate-rounded, vertical, scarcely exceeding one-seventh the total length; peristome unexpanded, the right margin arcuate, columellar margin narrowly expanded, dilated and somewhat appressed above. Alt. 24, diam.  $4\frac{1}{2}$  mill. (*Morel.*).

Variety: pale corneous, streaked lengthwise with reddish.

*Balsa de Cocharcas, Peru* (Angrand).





*B. veruculum* MOREL., Journ. de Conch., 1860, p. 376; Ser. Conch., iii, p. 211, pl. 11, fig. 11.—PFR., Monogr., vi, p. 95.—*Bulimulus* (*Peronæus*) *veruculum* PFR.—CLESS., Nomencl. Hel. Viv., p. 255.

Resembles *Cylindrella pruinosa* of the Isle of Pines, in form, size and coloration. The earlier 8 to 9 whorls form the tapering summit; the following are nearly equal and their form is quite exactly cylindrical; the last whorl is angular below. The shell is shining and corneous, appearing smooth to the naked eye, but with magnification some growth-striæ become visible. The coloration generally consists of a wide russet-brown band revolving upon a whitish ground; the first whorls are always of a uniform brownish shade. Sometimes the band is indistinct or replaced in whole or in part by oblique streaks, somewhat confused, reaching from suture to suture. (*Morel.*)

#### Section 7. *Peronæus* Albers, 1850.

*Peronæus* ALB., Die Hel., p. 163.—ALB.—MART., Die Hel., 1860, p. 221, (type *B. pupiformis*).—PFR.—CLESS., Nomencl. Hel. Viv., p. 225.

Shell rimate or perforate, long and narrow, with 7–11 whorls; aperture ovate, the outer lip expanded or not, columellar lip dilated. Type *B. pupiformis* Brod.

The numerous species of this group are restricted to northern Chili, Peru and the adjacent districts of Bolivia. They inhabit rainless situations for the most part, and are found under or among stones, or at the roots of grass or cacti. Hypsometrically, they range from near sea-level in Chili, to over 13,000 feet altitude on the Andean Plateau.

The group is closely allied to *Lissoacme*, being distinguished merely by the narrow form, generally more numerous whorls and smaller aperture.

#### Group of *B. pupiformis*.

*B. PUPIFORMIS* Broderip. Pl. 45, figs. 9, 10.

Shell rimate-perforate, long, tapering above, cylindrical below, rather solid; whitish, the earlier whorls blackish-orange or corneous, or entire shell corneous with narrow irregular white streaks. Surface smoothish, the growth-lines irregular, more prominent at sutures, and there is some superficial malleation throughout. Whorls 10–11,

weakly convex, the last three of about the same diameter, those above tapering to a slightly mamillar, obtuse, glossy apex; last whorl tapering and somewhat compressed toward the base with a small umbilical excavation.

Aperture slightly over one-fourth the total altitude, oblique, ovate; peristome obtuse, the outer lip regularly arcuate, distinctly expanded or spreading below; columellar lip expanded; ends connected by a white parietal callus.

Alt. 20, diam. 5·8 mill.; alt. of aperture 5·3 mill. (Specimen).

Alt. 18, diam. 5 mill.

Alt. 22, diam. 6 mill.; alt. of aperture 6 mill. (Pfr.).

*Huasco* (Cuming) and *Coquimbo* (Paz & Martinez), *Chili*.

*Bulinus pupiformis* BROAD., Proc. Zool. Soc., 1832, p. 105.—SOWB., Conch. Illustr., f. 27.—*Bulinus pupiformis* PFR., Symb., ii, p. 49; Monogr., ii, p. 113.—HUPE, in Gay, Historia de Chile, viii, Malacologia p. 114, pl. 2, f. 6.—HIDALGO, Moluscos Viaje al Pacif., p. 99.—? REEVE, Conch. Icon., pl. 14, f. 85.

Allied to *B. atacamensis*, but with wider and more dilated aperture.

B. ANACHORETA Pfeiffer. Pl. 45, figs. 11, 12, 13, 14.

Shell nearly covered rimate, fusiform-turrit, rather solid, smooth. White, sparingly variegated with tawny streaks. Spire convex-turrit, the apex rather acute, suture very superficial. Whorls 10, nearly flat, the last scarcely exceeding one-third the length of shell, attenuated at base. Columella somewhat straightened.

Aperture oblique, subrhombic-oval, white inside; *peristome white-lipped within*, the outer margin acute and narrowly expanded, curved above and then a little straightened; columellar margin dilated, reflexed and subadnate. Alt. 22, diam. 7½ mill.; aperture (with peristome), alt. 8 mill. (Pfr.).

*Paposo, Atacama desert, Chili* (Philippi, Paz).

*B. anachoreta* PFR., Malak. Bl., iii, 1856, p. 208; Monogr., iv, p. 422; Novit. Conch., iii, p. 376, pl. 87, f. 21, 22.—PHILIPPI, Reise durch Wüste Atacama, p. 184, pl. 7, f. 11a, b.—HIDALGO, Journ. de Conchyl., 1870, p. 56.

According to Philippi, the diameter varies considerable, from 2½ to 3½ lines; and the thickness of the callus within the lip also is variable. His figures illustrating variation are reproduced in f. 13, 14.

**B. LACTIFLUUS** Pfeiffer. Pl. 45, figs. 15, 16.

Shell similar to *B. atacamensis* but smaller, with  $9\frac{1}{2}$  whorls; thin; opaque white or faintly buff, alternating with numerous corneous or corneous-brown ragged, irregular streaks, as wide as the white streaks or wider; smooth, but slightly puckered under the sutures. Last whorl compressed below, subangular around the small umbilical perforation. External coloration visible within the aperture, which is contained  $3\frac{1}{2}$  times in altitude of shell, and is rather more expanded than in *B. atacamensis*; peristome thin, very narrowly expanded; columellar margin dilated and subreflexed.

Alt. 15, diam. 4.8 mill. (Specimens).

Alt.  $16\frac{1}{2}$ –17, diam.  $4\frac{2}{3}$  mill. (Pfr.).

*Cobija, Chili* (Paz; Coll. A. N. S. P.).

*Bulimus lactifluus* PFR., P. Z. S., 1856, p. 330; Monogr., iv, p. 407; Novit. Conch., p. 425, pl. 96, f. 13, 14.—HIDALGO, Journ. de Conchyl., 1870, p. 56.

Some specimens are albino with orange-black apical whorls; in others the apex is either dark or corneous. The species is very near to *B. atacamensis*, but smaller, more variegated than is usual in that form, and with the outer lip a trifle expanded. These differences, however, may be merely varietal. Pfeiffer's specimens were a little larger than those before me, and had 10 to 11 whorls.

**B. ATACAMENSIS** Pfeiffer. Pl. 45, figs. 17, 18, 19, 20.

Shell rimate-perforate, long, tapering, the last two whorls of about equal diameter; rather thin; opaque-white, with irregular brown or corneous stripes, sometimes the white predominating; apical whorls corneous or dark. Surface slightly shining, smooth, faintly or not puckered below the sutures. Whorls 10–11, a little convex, the last compressed below, subangular around the small umbilical excavation.

Aperture narrow-ovate, contained about  $3\frac{1}{2}$  times in length, but slightly oblique; peristome thin, acute, the outer lip not expanded, columellar lip dilated above; parietal callus very slight.

Alt. 19, diam.  $5\frac{1}{2}$  mill.; alt. aperture 5.2 mill. (Specimen).

Alt. 19, diam.  $5\frac{1}{2}$  mill.; alt. aperture  $5\frac{2}{3}$  mill. (Pfr.).

*Paposo, Atacama Desert, Chili* (Philippi).

*Bulimus atacamensis* PFR., Malak. Bl., iii, 1856, p. 207; Monogr., iv, p. 486.—HIDALGO, Journ. de Conch., 1870, p. 57; 1875, p. 128, pl. 7, f. 5.—*Bulimus longurio* CROSSE, Journ. Conch., 1869, p. 184.



The aperture is narrower than in *B. pupiformis*, and the outer lip is acute and not expanded. Hidalgo thinks that Reeve's figure 85 represents this species and not the true *pupiformis*.

*B. NANUS* Reeve. Pl. 45, fig. 22.

Shell rather elongated, umbilicated. Whorls 8, convex, very finely striated, *striae slightly plicated beneath the sutures*. Columella vertical; aperture small; lip simple. Pale ash color, obscurely marked here and there with light brown streaks, apex brown. Alt. 10 mill. (*Reeve*).

*Chili.*

*Bulimus nanus* REEVE, Conch. Icon., pl. 79, fig. 585 (Sept., 1849). —? PFR., Monogr., iii, p. 344.

Pfeiffer's description must be consulted with hesitation, for it was probably based upon another species. *B. nanus* is not known to me by specimens. It seems very closely allied to *B. lactifluus* and *atacamensis*.

*B. LEUCOSTICTUS* Philippi. Pl. 45, figs. 23, 24.

Shell subumbilicate, fusiform-turritid, thin, rather smooth; brownish, maculate and guttate with milky in scattered pattern. Whorls 8-9, moderately convex, the last one-fourth the length.

Aperture oblong-ovate, little oblique; peristome simple, thin, sub-reflexed; columellar margin broadly expanded; margins approaching, joined by a delicate parietal callus. (*Phil.*).

Alt.  $6\frac{2}{3}$ , diam. 2 lines; aperture, alt.  $2\frac{1}{4}$  lines. (*Phil.*).

Alt.  $14\frac{1}{2}$ , diam.  $4\frac{1}{2}$  mill.; aperture, alt.  $4\frac{1}{4}$  mill. (*Pfr.*).

*Paposo, desert of Atacama, Chili* (*Phil.*).

*Bulimus leucostictus* PHIL., Malak. Bl., 1856, p. 53; Reise durch die Wüste Atacama, p. 184.—PFR., Monogr., iv, p. 411; Novit. Conch., iii, p. 413, pl. 94, f. 17, 18.—HIDALGO, Journ. de Conch., 1870, p. 56.

This species shows sometimes a whitish, sometimes an almost rose-red color. It differs from *B. lichenum* in the smaller size, thinner shell and different coloration; the peristome is more strongly expanded, especially toward the columella, and the ends approach more. It differs from *B. terebralis* in being umbilicated, less slender, and with more approaching ends of the peristome. (*Phil.*).

Pfeiffer describes it as "striatulate, pale corneous, variegated with dots and little lines of opaque white."

**B. SCABIOSUS** Sowerby. Pl. 45, fig. 21.

Shell rimate-perforate, oblong-acuminate, closely and distinctly striate, rather solid; variegated corneous and white, the apex blackish. Whorls 8, rather flat, the last one-third the length of shell. Columella obliquely receding. Aperture oblong-oval, the peristome simple, unexpanded, columellar margin broadly dilated. Alt. 16, diam.  $4\frac{1}{2}$  mill.; aperture, alt.  $5\frac{1}{2}$  mill. (*Pfr.*).

*Cobjia, Chili*, under stones (Cuming, Orb.).

*Bulinus scabiosus* SOWB., P. Z. S., 1833, p. 74; Conch. Illustr., f. 24.—*Bulimus scabiosus* ORB., Voy. dans l'Amér. Mérid., p. 263; POT. & MICH., Galerie, i, p. 154, pl. 15, f. 7, 8.—REEVE, Conch. Icon., pl. 14, f. 84.—PFR., Monogr., ii, p. 210; vi, p. 139; Conchyl. Cab., p. 232, pl. 62, f. 34-36.

**B. TEREBRALIS** Pfeiffer. Pl. 45, fig. 30.

Shell rimate perforate, with the large *umbilical area defined by an angle; subulate*; whitish, becoming bluish-brown above. Surface lusterless, *irregularly wrinkle-striate*, the striæ somewhat cut into granules by spiral impressed lines which are generally more prominent above. Spire tapering from the last whorl to the blunt, smooth, brownish-corneous apex. Whorls about  $10\frac{1}{2}$ , *nearly flat*, the last cylindrical, *obliquely truncated below by a blunt but projecting angle over which the riblets do not pass*, and which defines the umbilical tract.

Aperture one-fourth the altitude, oblique, ovate, white inside. *Outer lip acute, expanded and thickened within*; columellar lip dilated above, vaulting over the minute perforation.

Alt. 19.5, diam. 5.2 mill.

Alt. 20.3, diam. 4.2 mill.

*Coquimbo, Chili*, under stones and on plants by the shore (Bridges).

*Bulimus terebralis* PFR., P. Z. S., 1842, p. 187; Symbolæ, ii, p. 51; Monogr., ii, p. 114; iv, p. 55.—HUPE in Gay, Hist. Chilé, viii, p. 115, pl. 3, f. 9.—REEVE, Conch. Icon., pl. 14, f. 79.

Varies somewhat in width, but not much in other characters. The sculpture and the basal keel are characteristic. It is allied to the smoother and stouter *B. pupiformis*, but the basal carina also suggests relationship with the group of *B. columellaris*.

**B. BISCUPTUS** Pfeiffer. Pl. 45, figs. 25, 26.

Shell subperforate, oblong-turritid, rather solid; *lightly plicate-striate above, smooth below the middle*; slightly shining; white,

irregularly ornamented with *longitudinal reddish lines, interrupted into dots*, sometimes in pairs. Spire turrited, the apex a little acute, pale. Whorls  $8\frac{1}{2}$ , convex, the last not attaining one-third the entire altitude, and somewhat attenuated at base.

Aperture slightly oblique, auriform-oval, white within; *peristome simple, not expanded, acute; columellar margin very much dilated above, reflexed, almost closing the perforation*. Columella somewhat twisted. Alt. 18, diam. 6 mill.; aperture 6 mill. long, 3 wide. (*Pfr.*).

*Province of Huancayo, Peru.*

*B. biscalptus* PFR., Malak. Bl., xvi, 1869, p. 89; Novit. Conch., iii, p. 492, pl. 106, f. 7, 8; Monogr., viii, p. 156.

Similar to *B. emaciatius* Morel., but differing in the regularly turrited spire and form of the aperture. It differs from *B. elatus* Phil. in the more convex, shorter whorls, nearly closed perforation, etc. (*Pfr.*).

*B. EMACIATUS* Morelet. Pl. 45, figs. 27, 28.

Shell *subimperforate*, turrited-subulate; rather solid, obsoletely ribbed-striate; opaque, hardly shining, white. Suture impressed. Spire lengthened, the apex pale corneous. Whorls 10, convex, the last not reaching one-fourth the total length of shell.

Aperture oblique, oblong-oval, *attenuated at base*, brownish-yellow inside; *peristome simple, not expanded*, the columella margin narrowly dilated and *appressed*. Alt. 22, diam.  $5\frac{1}{2}$  mill.

A variety is striated longitudinally with reddish.

*Interior vallies and plateaux in the Sierra, from Ayacucho to Cuzco, Peru* (Angrand).

*Bulimus emaciatius* MOREL., Sér. Conch., iii, p. 201, pl. 11, f. 10 (1863).—PFR., Monogr., vi, p. 119.

This species, belonging to the group of *B. lichenum*, *hamiltoni*, *rhodacme*, etc., is a very much elongated shell, solid, white, moderately shining, with rare traces of punctation. The two or three earlier whorls of the spire are smooth and corneous; the following are engraved with oblique and rather wide but superficial striæ; the last whorl has a moderate aperture, noticeably angular at the base and fawn-colored inside. The columella is nearly vertical, dilated feebly above, forming a triangular lamina which is applied to the umbilical region. When this expansion does not adhere quite



exactly to the part of the whorl-wall there is a narrow chink left, which must not be confused with a real perforation.

*B. emaciatius* is not without analogy with *B. hamiltoni*, but is distinguished by the lengthened spire with three more whorls, by the form of the aperture and the absence of an umbilical perforation. Moreover, the shell is less rudely and less deeply striate. (*Morel.*).

*B. SPICULATUS* Morelet. Pl. 45, fig. 29.

Shell rimate, *subulate*, slightly solid, pale brownish ashen, sometimes with faint oblique brown streaks, the apical whorls either corneous, purplish or reddish. Surface lusterless, *closely, finely and rather regularly rib-striate*. Spire slowly tapering with slightly convex outlines to an obtuse apex. Whorls about  $10\frac{1}{2}$ , the earlier smooth and convex, the rest *nearly flat*; last whorl gently rounded below, *the rib-striae extending into umbilical rimation*.

Aperture small, contained about  $4\frac{1}{2}$  times in altitude of shell, *chestnut-brown within*, oblique. Outer lip acute, slightly expanded below; columella rather long, *its inner edge with a convex fold*; outer margin dilated above; parietal callus slight. Alt. 19-24, diam. 4-5 mill.

*Valley of Ollantaitambo, Peru*, in arid places among cacti (Angrand).

*Bulimus spiculatus* MOREL, Journ. Conch., 1860, p. 375; Sér. Conch., iii, p. 203, pl. 11, f. 3.—PFR., Monogr., vi, p. 55.

This is even more slender than most specimens of *B. terebralis*, with smaller and colored aperture, no basal keel, and lacking spiral sculpture.

*B. ACROMELAS* Morelet. Pl. 45, fig. 31.

Shell subimperforate, subulate-turritid, rather solid; irregularly flexuously striate, somewhat shining. White, marked with rare corneous dots, bluish-black above. Spire lengthened, perceptibly tapering, rather acute. Whorls 11, a little convex, the last slightly exceeding one-fourth the length.

Aperture oblique, small, attenuated at base, irregularly semioval; peristome simple, not expanded, the columellar margin dilated above and appressed. Alt. 17, diam. 5 mill. (*Morel.*).

*Vallies of Ayacucho and Urubamba, Peru* (Angrand).

*B. acromelas* MOREL., Sér. Conch., iii, p. 202, pl. 11, f. 1.—PFR., Monogr., vi, p. 119.

Distinguished from other species of the same group, by the insensible tapering of the spire toward the apex, and cylindrical form toward the base. The earlier three whorls are of a brownish-violet, which fades out below, the latter two whorls being nearly pure white. The umbilical region ordinarily has a trace of a russet zone. The surface is engraved with irregular, flexuous striæ, more pronounced toward the sutures; and there is a small number of brown or corneous dots, scattered at random over the surface.

*B. LICHENORUM* d'Orbigny. Pl. 46, figs. 34, 35.

Shell elongated, turriculate, umbilicated; striate or subrugose; whitish, longitudinally marbled with grayish-yellow, a reddish spot on the last whorl near the mouth. Spire lengthened, subconic, the apex obtuse. Whorls 8, equal, suture flat. Aperture oblong, narrow, whitish, the lip thin, sharp; columella thick, a little dilated, in part covering the narrow and rather shallow umbilicus.

Alt. 15, diam. 5 mill. (*Orb.*).

*Plains at the foot of the mountains of Cobija, on lichen-covered rocks exposed to the sun. (Orb.)*.

*Helix lichenorum* d'ORB., Mag. de Zool., 1835, p. 20. Not *Bulinus lichenorum* d'ORB., SOWB., Conch. Illustr., f. 81, 82.—*Bulimus lichenorum* d'ORB., Voy. dans l'Amér. Mérid., p. 264, pl. 41, f. 9-11.—*Cochlicellus lichenum* BECK, Index, p. 63.—*Bulimus lichenum* PFR., Monogr., ii, p. 112; iii, 346.

Allied to *B. scabiosus*, but distinguished by the white color marbled with gray instead of brown, the less elongated form, and the whorls of the spire are not swollen.

*B. SUBCACTORUM* Pilsbry, n. n. Pl. 46, fig. 36 (enlarged).

Shell oblong-turritid, umbilicate; whorls 7, somewhat rounded, smooth or finely striated; columella reflected. Aperture rather small, lip simple. Bluish-white, with a few oblique ashy streaks, apex blackish. (*Reeve*).

*Chilon, Bolivia, under dead trunks of cacti (Bridges)*.

*Bulimus lichenorum* REEVE, Conch. Icon., pl. 14, f. 83, not of d'Orbigny.

The dark apex, regular oblique streaks and apparent lack of a brown spot behind the peristome, indicate that Reeve's shell is not the true *B. lichenorum* of d'Orbigny. The localities, moreover, are widely separated.



B. TSCHUDII Troschel. Pl. 45, figs. 32, 33.

Shell perforate, oblong, the apex attenuated, rather acute; somewhat smooth or striate, opaque, whitish, sometimes with brown bands of dots. Whorls 7-8, convex, the last somewhat compressed in the middle, one-third the entire length.

Aperture oval-oblong; peristome simple, not expanded, the margins converging; right margin curved above, produced forward; columellar margin short, subvertical and dilated.

Alt. 9, diam.  $3\frac{1}{2}$  mill.; aperture, alt.  $2\frac{3}{4}$  mill. (Pfr.).

*Huaura and Huacho, Peru, on walls (Tschudi).*

*Bulimus tschudii* TROSCHER, Archiv für Naturg., 1852, i, p. 195, pl. 5, f. 7.—PFR., Monogr., ii, p. 163 (1848); vi, p. 103.

This species is especially distinguished by the compression of the last whorl. All of the specimens collected, about 30 in number, were so characterized; and in most of them the compression was so great that the whorl could not be called convex, and an indication of two faint keels was mentionable. Most of the specimens were weathered and had lost their color, wholly or in part. On some could be seen that on a yellowish translucent ground, there are very irregular, white, opaque flecks; that further, a few irregular longitudinal brown streaks occur; and that there are narrow, brown interrupted spiral bands, three on the upper, six on the last whorl. (Troschel).

*Group of B. williamsi.*

B. WILLIAMSI Pfeiffer. Pl. 46, figs. 37, 38, 39.

Shell imperforate, subulate, rather solid, striatulate; white, painted with deep chestnut streaks, darker and closer below; spire turritid, the apex obtuse. Whorls 8, rather flat, the last not one-third the entire length, compressed at base.

Aperture slightly oblique, oblong; peristome simple, not expanded, the margins subparallel, columellar margin thin, adnate.

Alt. 24, diam.  $6\frac{1}{2}$  mill.; aperture  $7\frac{1}{2}$  mill. long, 3 wide. (Pfr.).

*Catamarca, Andes of Peru (Williams).*

*Bul. williamsi* PFR., P. Z. S., 1858, pl. 257, pl. 42, f. 1; Malak. Bl., 1859, p. 44; Monogr., vi, p. 108; Novit. Conch., iii, p. 467, pl. 101, f. 24, 25.

Judging from what I have seen, this species is sometimes decoliate and plugged like a *Cylindrella*. Such a specimen before me



has  $6\frac{1}{2}$  whorls remaining. There is an umbilical rimation, and the aperture is dark-streaked within, with a faint trace of a spiral light median band.

*B. PELIOSTOMUS* Philippi. Pl. 46, figs. 40, 41.

Shell compressed-umbilicate, oblong-turritid, solid, rather roughly striate, a little shining, *white*. Spire long, somewhat regularly turritid, the apex acute; suture slight, irregularly crenulated. Whorls 7, the embryonic convex and glossy, the rest rather flat; last whorl about three-sevenths the shell's length, *compressed and narrowed at base*.

Aperture subvertical, narrowly oblong, rounded at base, *black-brown inside*; peristome simple, the margins subparallel, outer margin very gently ascending above, the columellar margin dilated and wide above, *black-brown*. Alt. 21, diam. 7 mill.; aperture, alt. 9, width  $3\frac{1}{2}$  mill. (*Pfr.*).

*Between Jocos and the Marañon River, Peru (Raimondi); Pataz, Peru (Paz).*

*B. peliostomus* Phil. in letter, PFR., Malak. Bl., xiv, 1867, p. 77; Monogr., vi, p. 136; Novit. Conch., iii, p. 466, pl. 101, f. 22, 23.—HIDALGO, Journ. de Conch., 1875, p. 131.

Shorter than *B. williamsi*, umbilicate, and white outside.

*B. ANDOICUS* Morelet. Pl. 46, figs. 42, 43, 44.

Shell narrowly umbilicated, rather solid, oblong-turritid, subfusiform, obsoletely striated, little shining; whitish, striped with narrow, pale reddish streaks, fainter on last whorl. Spire sensibly attenuated, the apex rather acute. Whorls 8, slightly convex, the last attenuated at base, *compressed around the umbilicus*, three-sevenths the length of the shell.

Aperture oblong, little dilated, *subangular beneath*, tawny wine-color within; peristome simple, unexpanded, the basal margin a trifle expanded; *margins approaching*, the outer regularly arcuate, columellar nearly straight, dilated and somewhat reflexed. Alt. 26–30, diam. 9–10 mill. (*Morel.*).

Variety: smaller, whitish or ashen, unicolored or irregularly banded. Alt. 22, diam.  $7\frac{1}{2}$  mill.

*Valley of Ayacucho, Peru, in arid places (Angrand).*

*B. andoicus* MOREL., Journ. de Conch., 1860, p. 373; Sér. Conch., iii, p. 198, pl. 11, f. 13.—PFR., Monogr., vi, p. 120.

Variable in size. The last whorl is compressed around the umbilicus, which is generally narrow and not deep. In some individuals the umbilicus is very narrow, and the basal angle tends to disappear. It is wider than the somewhat allied *B. williamsi* Pfr.

*B. PRODUCTUS* Philippi. Pl. 46, figs. 46, 47, 48.

Shell compressed-perforate, oblong-turritid, rather solid, irregularly striate or subrugulose, little shining, flesh-whitish, sometimes marked with pale brownish linear streaks. Spire turritid, the apex rather acute, suture impressed. Whorls 7-7½, the embryonal whorls glabrous and subcorneous, the rest moderately convex, last whorl scarcely two-fifths the length of shell, a little compressed at base.

Aperture subvertical, oblong, brownish-fleshy inside; peristome simple, thin, the outer lip unexpanded, slightly arcuate above; columellar lip dilated above, reflexed, spreading over the perforation. Alt. 21½, diam. 7½ mill.; alt. of aperture 8⅔ mill. (*Pfr.*).

*Sierra Cotahuasi, Peru (Raimondi).*

*B. productus* Phil., *PFR.*, *Malak. Bl.*, xiv, p. 77, 1867; *Novit. Conch.*, p. 353, pl. 82, f. 23-25; *Monogr.*, vi, p. 140.

Very similar to the figure of *B. andoicus* Morel., but the aperture is not angular at base.

*B. ALBICOLOR* Morelet. Pl. 46, figs. 49, 50.

Shell rimate, rather solid, oblong-turritid, irregularly and delicately striatulate, shining, whitish. Spire turritid, the apex acute, corneous, sometimes violaceous. Whorls 8, convex, the last shortly attenuated at base, somewhat compressed around the narrow rimation, and nearly three-sevenths the length of shell.

Aperture oblong oval, tawny inside; peristome simple, acute, unexpanded, the outer margin lightly arcuate, columellar margin very narrowly dilated above, reflexed. (*Morel.*).

Alt. 28, diam. 9 mill. (typical).

Alt. 18, diam. 7 mill. (small form).

*Huanta, and valley of Apurimac R., Peru (Angrand).*

*B. albicolor* MORELET, *Journ. Conch.*, 1860, p. 374; *Sér. Conch.*, iii, p. 199, pl. 11, f. 9.—*PFR.*, *Monogr.*, vi, p. 135.

A shell of variable size, uniform white outside, russet fawn color within, with the margins of the peristome darker and the earlier two whorls of a fawn or purple shade. It is engraved with superficial, irregular striæ, and marked with a very small number of blackish

dots, scattered at random, as in *B. andoicus*. It differs from *andoicus* in the contraction of the umbilical cavity, the form of the aperture, which is less elongated, and by the quite considerable separation of the ends of the peristome.

*B. LESUEUREANUS* Morelet. Pl. 46, fig. 45.

Shell rimate-perforate, turritid; a little shining, opaque, whitish, unicolorous or banded with ashen. Apex acute and pale corneous. Whorls 7, little convex, the uppermost smooth, the rest *costulate-striate*; last whorl usually somewhat rugose, shortly attenuated at base, rounded, compressed around the rimation, not attaining one-third the length of shell.

Aperture subvertical, oblong, pale fulvous within; peristome simple, acute, unexpanded, the columellar margin narrowly dilated and reflexed. Alt. 22, diam. 7 mill. (*Morel.*).

*Pomacocha and Cocharcas, Andean Plateau, Peru* (Angrand).

*B. lesueureanus* MOREL., Journ. Conch., viii, 1860, p. 374; Sér. Conch., iii, p. 200, pl. 9, f. 4.—PFR., Monogr., vi, p. 137.

This *Bulimus* is white with a perceptible tint of fawn at the base, and some sparse vestiges of punctation. Certain individuals are unicolorous, others ornamented with gray bands which are more or less numerous, sometimes confluent, and visible within the aperture. The earliest whorls of the spire are smooth and corneous; the rest sculptured with small, low, sinuous and close riblets, progressively enlarging and then becoming unequal and confused; the last sometimes with cracks and irregular rugosities. It is narrower than *B. albicolor*. This species lives at Pomacocha and Cocharcas, temperate vallies of the plateau of the Cordillera, where the culture of wheat reaches its extreme limit.

*B. HAMILTONI* Reeve. Pl. 46, fig. 51.

Shell umbilicate, turritid; rather solid, *rudely plicate-striate*; opaque, *white*; spire elongated, slender, *the apex red*. Whorls 8, convex, the last not attaining one-third the length, somewhat compressed around the narrow umbilicus. Columella receding. Aperture little oblique, oval; peristome simple, unexpanded, the margins approaching, columellar margin widely reflexed above. Alt. 18, diam. 6 mill.; aperture  $5\frac{1}{2}$  mill. long, 3 wide. (*Pfr.*).

*Mountains near Lake Titicaca, Bolivia, 14000 ft. alt.* (Pentland).



*Bulimus hamiltoni* REEVE, Conch. Icon., pl. 83, f. 610 (Dec., 1849).—PFR., Monogr., iii, p. 429; iv, p. 493; vi, p. 140.—HUPE, in Castelnau's Exped., Moll., p. 49, pl. 9, f. 5.—MORELET, Sér. Conch., iii, p. 201.

M. Angrand collected this species in Peru, between Aguas Calientes and Andahuaylas, on the slopes of the temperature vallies of the Cordillera, and in the cold regions of Argama and Huanacarama. It is found in dry places, on herbaceous plants.

**B. ELATUS** Philippi. Pl. 46, figs. 52, 53.

Shell perforate, conic-turrit, irregularly striatulate, often plicatulate towards the apex, a little shining. White, unicolored or ornamented with pale brown streaks. Spire turrit, the apex rather acute, pale corneous. Whorls 9 to 10, a little convex, the last not attaining one-third the altitude, rarely begirt with a brown line below the middle; base rounded.

Aperture little oblique, oblong; peristome simple, unexpanded, acute; columellar margin membranous, reflexed above, nearly covering the perforation. Dimensions of largest specimen: alt. 21, diam. 6 mill.; aperture, alt. 6, width  $3\frac{1}{2}$  mill. (*Pfr.*).

*Between Mayoc and Huanta, Peru (Raimondi).*

*B. elatus* PHIL., Malak. Bl., xvi, 1869, p. 33.—PFR., *t. c.*, p. 89; Novit. Conch., iii, p. 469, pl. 102, f. 5, 6; Mongr., viii, p. 173.

Similar in form to *B. hamiltoni* Reeve, but the perforation is narrow; whorls striatulate, not plicate; and the aperture narrower, and oblong.

**B. CERATACME** Pfeiffer. *Unfigured.*

Shell deeply and narrowly rimate, subfusiform-oblong, rather solid, irregularly striatulate, little shining; fleshy-whitish. Spire elongate, the apex corneous, rather obtuse. Whorls  $7\frac{1}{2}$ , little convex, the median ones remotely and obsoletely streaked with corneous, last whorl slightly exceeding a third of the total alt., somewhat attenuated at base. Columella receding, lightly folded. Aperture slightly oblique, oblong-oval; peristome acute, somewhat lipped within, the margins approximating, joined by a thin callus, right margin expanded, arcuate above, columellar margin widened. Alt.  $18\frac{1}{2}$ , diam. 6 mill.; aperture 7 mill. long, 4 wide. (*Pfr.*).

*Peru ?*

*B. ceratacme* PFR., P. Z. S., 1855, p. 8; Monogr., iv, p. 424.

Similar to *Buliminus sidoniensis* Fér., differing in the oblong aperture, columellar fold, etc. (*Pfr.*).

Locality and systematic position very doubtful.

**B. BIFORMIS** Pfeiffer. Pl. 46, figs. 61, 62.

Shell profoundly rimate, ovate-oblong, rather solid, rather rugosely striatulate. Spire ovate-conic, the apex obtuse; suture subcrenate. Whorls 6, the earlier 3 corneous and convex, the rest a little convex, whitish; last whorl about equal to two-fifths the total alt., a little compressed at base.

Aperture little oblique, truncate-oblong, the columella very slightly folded; peristome white-lipped, margins joined by a thin callus, the outer margin unexpanded, a little expanded below; columellar margin dilated, flat, wide. Alt. 14, diam. 6 mill.; aperture, alt. 6, width 3 mill. (*Pfr.*).

*Peru?*

*B. biformis* PFR., Malak. Bl., i, 1854, p. 223; Monogr., iv, p. 498; Novit. Conch., iii, p. 492, pl. 106, f. 5, 6.

A very doubtful member of this group. It may prove to be an Old World species of the genus *Buliminus*.

**B. WOODWARDI** Pfeiffer. *Unfigured*.

Shell perforate, ovate-turritid, rather solid, striatulate and submalleate, rather shining, tawny-white. Spire long-conic, rather acute. Whorls 8, a little convex, the last little shorter than the spire, subattenuated at base. Columella receding. Aperture oblique, oval-oblong; peristome simple, unexpanded, the right margin slightly arcuate; columellar margin dilated above, vaultingly reflexed, half covering the narrow perforation. Alt. 31, diam. 13½ mill.; alt. of aperture 15, width 7 mill. (*Pfr.*).

*Andes of Peru* (Cuming Coll.).

*B. woodwardi* PFR., P. Z. S., 1856, p. 332; Monogr., iv, p. 488; Nomencl. Hel. Viv., p. 256 (*Peronæus*).

**B. CALCHAQUINUS** Doering.

Shell rimate, fusiform-turritid, thin, irregularly and closely rugose-striated; corneous or corneous-buff, variegated with whitish, raised, rugose, irregular streaks. Spire long, rather obtuse. Whorls 8, moderately convex, the first corneous, smoothish, the rest variegated; last whorl convex, about one-third the total alt.

Aperture oblong-oval; peristome simple, acute, straight; columellar margin reflexed, half covering the perforation. Alt. 17-19, diam.  $6\frac{1}{2}$ -7 mill.; aperture, length  $6\frac{1}{2}$ , width  $3\frac{1}{2}$  mill. (*Doer.*).

*Sierra de Belen, prov. Catamarca, Argentina* (Dr. Hieronymus).

*Peronæus calchaquinus* DOER., Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 64 (1879).

Readily distinguished from *famatinus* by the color and size; the aperture is relatively smaller, columellar margin a little more narrowly reflexed, whorls more convex, etc.

#### B. FAMATINUS Doering.

Shell rimate, thin, fusiform-turrit, longitudinally rather closely costulate, opaque whitish (or rarely with a few corneous streaks); spire long, the apex a little attenuated, slightly obtuse. Whorls 7, the earlier yellowish, smooth; last whorl slightly exceeding one-third the length. Columella simple; aperture oblong, oval; peristome simple, straight; columellar margin narrowly reflexed, partly closing the perforation. Length 19, diam. 6 mill.; length of aperture  $6-6\frac{1}{2}$ , width 4 mill. (*Doering*).

*Sierra de la Rioja, at about 2000 meters alt., between Rioja and Chilecito, Prov. Rioja, Argentina* (Stelzner).

*Peronæus famatinus* DOER., Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 63.

The jaw has 12 narrow plaits. Teeth in straight transverse series. It is thus a true *Bulimulus*.

#### *Group of rhodacme.*

#### B. RHODACME Pfeiffer. Pl. 46, fig. 54.

Shell openly rimate, narrowly long-ovate, rather solid. *White, with irregular pellucid or pink maculation, often suffused with a roseate blush on the spire, sometimes unicolored white.* Surface lusterless, with *rude, irregular growth-striae, sparsely decussated, or bearing granules in spiral series.* Spire conic, with slightly convex outlines, the apex obtuse. Whorls 6, *the upper ones very convex* with deep sutures, the lower two less convex, suture slightly and irregularly crenulate; the apical  $1\frac{1}{2}$  whorls smooth, corneous or roseate. Last whorl not compressed below.



Aperture over one-third the altitude of shell, long-oval, white within; peristome not expanded, slightly thickened within, the columellar margin dilated above.

Alt. 12.6, diam. 5.2 mill.; alt. of aperture 4.8 mill.

Alt. 12.2, diam. 5 mill.; alt. of aperture 4.6 mill.

*Frierina*, near *Huasco*, *Chili* (Bridges), under low cacti.

*Bulimus rhodacme* PFR., P. Z. S., 1842, p. 187; Symbolæ, ii, p. 50; Monogr., ii, p. 211; Conchyl. Cab., p. 230, pl. 62, f. 25-27.—HUPE in Gay, Hist. Chile, p. 113.—REEVE, Conch. Icon., pl. 14, f. 77.

The rose color is variable in amount, and nearly absent on some specimens. The sculpture is quite characteristic, although also variable in degree of development.

*B. PUSTULOSUS* Broderip. Pl. 46, fig. 58.

Shell umbilicate-rimate, oblong-conical, rather solid, calcareous. White or pale brownish, often with some scattered corneous-brown dots, the earlier two whorls corneous. Surface lusterless, *rudely closely and irregularly plicate-striate, with stronger folds at rather wide but unequal intervals; the longitudinal folds and striæ cut into rather coarse granules by incised spirals*, unequally developed; the sculpture weaker above, absent on the smooth apical whorls. Spire conic; whorls 6-6½, *convex*, the last with an ample umbilical excavation, but only a minute perforation.

Aperture subovate, contained 2½ to 2¾ times in altitude of shell, whitish or brown inside; peristome slightly thickened within, the outer lip regularly arcuate, not expanded, columellar lip dilated above, ends of the lip approaching.

Alt. 14, diam. 7½ mill.

Alt. 13.2, diam. 6.8 mill.

*Huasco*, *Chili* (Cuming, Paz and Martinez), under stones in sandy situations.

*Bulinus pustulosus* BROD., P. Z. S., 1832, p. 105.—SOWB., Conch. Illustr., f. 23 (not good).—*Bulimus pustulosus* DH. in An. s. Vert., viii, p. 273.—PFR., Monogr., ii, p. 217; vi, 140; Conchyl. Cab., p. 227, pl. 62, f. 13-15.—REEVE, Conch. Icon., pl. 20, f. 127.—HUPE in Gay, Hist. Chile, viii, p. 112, pl. 2, f. 4.—HIDALGO, Mol. Viaje al Pacif., p. 90; Journ. de Conch., 1870, p. 53.

Very much stouter than *B. rhodacme*, and more irregularly and roughly sculptured, but evidently allied. There is a wide range of

variation in the development of the sculpture, some specimens being conspicuously granulate, others very obsoletely so. The comparative width also varies.

*B. SCALARIOIDES* Philippi. Pl. 46, figs. 59, 60.

Shell perforate, oblong-turritid, solid, striatulate and *sculptured with rather remote strong folds* (about 10 on the last whorl). Opaque, white. Spire turritid, the apex rather obtuse; suture profound. Whorls 6, convex, the last nearly equalling two-fifths the length of the shell.

Aperture subvertical, oblong, *flesh-colored inside*; *peristome simple*, the right margin unexpanded, arcuate above; columella brownish, shining, dilated above, nearly appressed. Alt.  $12\frac{1}{2}$ , diam. 5 mill.; aperture, alt. 5 mill. (*Pfr.*).

*Pataz (Paz), and Province of Conchucos, Peru.*

*B. scalarioides* Phil. in sched., *PFR.*, Malak. Bl., xiv, 1867, p. 77; Monogr., vi, p. 140.—*HIDALGO*, Journ. de Conchyl., 1870, p. 53; xxiii, 1875, p. 128, pl. 7, f. 4.

Hidalgo gives the number of longitudinal folds as 10 to 14 on the last whorl.

#### Section 8. *Lissoacme* Pilsbry, 1896.

*Lissoacme* PILS., Nautilus, ix, p. 114 (Feb. 1, 1896).—*Scutalus Thaumastus* and *Rhabdotus* in part of authors.

*Bulimuli* of rather stout, ovate contour, with the smooth, glossy first whorl and initial dimple of *Bostryx*. Aperture over a third, usually about one half the total length, the outer lip simple and unexpanded (with very few exceptions), the columellar lip dilated, columella foldless or nearly so; umbilicate or perforate. Type *B. erythrostomus*.

The forms included in this section (which like the foregoing sections of *Bostryx* is a division for convenience rather than a sharply defined group) are especially characteristic of Chili, Peru, and the adjacent portion of Bolivia. Few occur so far north as Ecuador. Eastward, the group extends entirely across Argentina, but here the species are conspicuously thin-shelled, while the trans-Andean types are of solid and earthy texture.

North American *Bulimuli* of the *B. dealbatus* and *schiedeanus* group closely resemble the *Lissoacme* species in form and texture, but the characters of the earliest whorls are completely different.

The *smooth apex* is a perfectly constant and reliable diagnostic feature; but as few descriptions mention the minute sculpture of the apex, it is impossible at present to classify with any degree of certainty, those forms not known to me by specimens. It will be necessary to reexamine the types of a large number of species, in order to discriminate between some forms of *Scutalus*, *Lissoacme*, *Leptomerus* and even *Drymæus*. Some thin species of Argentina and Bolivia in particular are of doubtful position, and will remain so until the characters of their apices are made known.

The species are very numerous, and for the present may be thrown into groups as follows:

- a. Adult shell strongly keeled; surface malleated,  
Group of *B. reentsi*.
- aa. Adult shell with rounded periphery.
  - b. Outer lip expanded, Group of *B. derelictus*.
  - bb. Outer lip not expanded.
    - c. Surface wrinkled or striate, with no spiral lines,  
Group of *B. hennahi*.
    - cc. Surface wrinkled or striate, with spiral lines,  
Group of *B. erythrostomus*.
    - ccc. Shell thin, unicolored or streaked, species of Argentina and Bolivia,  
Group of *B. apodemetes*.

*Group of B. reentsi.*

B. REENTSI Philippi. Pl. 48, figs. 89, 90.

Shell umbilicated, ovate-conic, *keeled, solid and calcareous*. Dull white. *Surface roughly sculptured* with very irregular longitudinal and short transverse wrinkles, having a crinkled or shrivelled aspect. Spire conic; apex mamillar, smooth and corneous, or sometimes eroded. Whorls 7, slightly convex, the last carinated at the periphery, but slightly convex below, not excavated around the rather narrow but *deep and well-like umbilicus*.

Aperture less than half the length of shell, very oblique, subrhomboidal; peristome white, sharp, the outer and basal lips expanded; columella straight, reflexed, the recurved margin wider above, partly closing the umbilicus; parietal wall calloused. *Entire interior of aperture deep purple and rose*.

Alt. 25, diam. 18 mill.

*Top of a lofty sand hill near Chala, Peru (Ernesto Denicke).*



*Bulimus reentsi* PHILIPPI, Zeitschr. f. Mal., viii, p. 30, no. 1, June, 1851.—PFR., Monogr., iii, p. 372; Conchyl. Cab., p. 124, pl. 36, f. 22, 23.—*Bostryx reentzi* SCHAUF., in Paetel's Catal., p. 81.—*Bulimus denickei* GRAY, P. Z. S., 1851, p. 92 (published Dec. 7, 1852; see P. Z. S., 1893, p. 439).—REEVE, t. c., p. 93.—PFR., Monogr., iv, p. 440.—*Orthalicus (Rabdotus) denekei* H. & A. AD., Gen. Rec. Moll., p. 158.

Slightly like *B. binneyanus* Pfr., but differs markedly in sculpture, and in the absence of a keel on the whorls of the spire. Reeve very justly compares it to *B. lemniscatus* Desh., a species which is not keeled, but is certainly nearly allied.

Pfeiffer restored Gray's name to this species in the later volumes of the Monographia because the date of presentation of Gray's description before the Zoological Society of London was prior to Philippi's publication. Philippi's description, however, was *actually published* in the sense of being printed and distributed, first; so that under existing rules, which disregard the mere date of reading, the name *reentsi* has precedence.

#### Group of *B. hennahi*.

*B. STYLIGER* Beck. Pl. 47, fig. 64.

Shell openly umbilicated, ovate-conic, with *suddenly attenuated apex*; thin, smooth; whitish, encircled with wide brown bands, often interrupted. Whorls 7, convex, the last a little longer than the spire, ventricose; columella rather straightened, roseate. Aperture oval, the peristome simple and acute, right margin arcuate, columellar margin spreading above in a triangular lamina. Alt. 29, diam. 18 mill.; aperture 15 mill. long, 9 wide inside. (*Pfr.*).

*Ilo, Peru* (Cuming).

*Bulinus vittatus* BROD., P. Z. S., 1832, p. 31.—SOWB., Conch. Illustr., f. 6, 6\*; Zool. Beechey's Voy., p. 144, pl. 38, f. 14. (Not *Bulimus vittatus* Spix).—*Buliminus styliger* BECK, Index Moll., p. 70.—*Bulimus styliger* PFR., Monogr., ii, p. 193; iii, p. 416; iv, p. 476; vi, p. 122; vii, p. 159.—*Bulimus lemniscatus* DESH. in Lam., An. s. Vert., viii, p. 271.—REEVE, Conch. Icon., pl. 18, f. 105.

*B. HENNAHI* Gray. Pl. 47, figs. 65, 66, 67, 68.

Shell umbilicated, ovate-conic, solid but rather thin; whitish, with few or numerous unequal oblique brown streaks (rarely wanting), and usually more or less cut into segments by a few narrow spiral

light bands. *Surface rudely, coarsely and irregularly wrinkled by growth-lines.* No spiral sculpture. Spire conic, rather attenuated above, apex mamillar, smooth, brownish or white. Whorls  $6\frac{1}{2}$  to  $7\frac{1}{2}$ , convex below the deep sutures.

Aperture ovate, lilac tinted within, oblique, usually not half the length of shell. Outer lip thin and sharp, unexpanded; columella slightly concave, lilac tinted, the columellar lip dilated above. Parietal callus thin, roseate or white.

Alt. 29, diam. 16 mill.; alt. of aperture  $12\frac{3}{4}$  mill.

Alt.  $23\frac{1}{2}$ , diam.  $14\frac{1}{2}$  mill.; alt. of aperture 12 mill.

*Peru, at Arica* (Hennah) *and Tacna* (Angrand, Paz), on cacti in sandy places.

*B. hennahi* GRAY, Spicil. Zool., i, p. 5, pl. 5, f. 5 (1830).—FER., Bull. Sci. Nat., xvi, 1829, p. 468.—ORBIGNY, Voy. dans l'Amér. Mérid., p. 283, pl. 30, f. 3, 4.—PFR., Monogr., ii, p. 197; vii, p. 163; Conchyl. Cab., p. 198, pl. 55, f. 7, 8.—REEVE, Conch. Icon., pl. 88, f. 148 b.—MORELET, Sér. Conch., iii, p. 184.—HIDALGO, Viaje al Pacif. Mol., p. 87; Journ. de Conch., 1870, p. 52.—MARTENS, Conch. Mittheil., pp. 162, 209.—*B. rubescens* REEVE, Conch. Icon., pl. 23, f. 148.—*Bulinus lychnorum* SOWB., Conch. Illustr., f. 81, 82 (not *Bul. lichenorum* Orb., see p. 145 of this vol.).—*Helix cactorum* ORB., Revue Zool., 1835, p. 10.—*B. virginialis* MOREL., Journ. de Conch., 1860, p. 372.

The coloring varies a good deal, as the figures show. The surface is more rudely wrinkled than in the allied species. Morelet's *B. virginialis* is a white specimen, orange within aperture, the lips roseate. He subsequently united it with *hennahi*, as did Reeve his *rubescens*.

B. METAMORPHUS n. sp. Pl. 1, figs. 6, 7.

Shell umbilicated, ovate, with produced, concave-conic spire; rather solid; whitish or light brown with numerous oblique chestnut streaks. Surface lusterless, with rather coarse but not conspicuous wrinkles of growth, without spiral striæ. Spire turreted, attenuated above, with obtuse, smooth apex and comma-shaped axial dimple. Whorls 8, the first rapidly increasing and rather bulbous, the rest narrowly convoluted, moderately convex, the last rather disproportionately large and convex, obtusely angular around the capacious umbilicus, which penetrates to the apex and is dusky inside.

Aperture ovate, less than half the shell's length, brown and yellowish within (or white in old shells); outer lip simple, thin and unexpanded; columellar lip dilated as usual, the columella nearly straight.

Alt. 29, diam. 17, alt. of aperture  $14\frac{1}{2}$  mill.

Alt. 28, diam. 16-17, alt. of aperture  $12\frac{1}{2}$  mill.

*Chili.*

Somewhat like *B. hennahi*, but the whorls are more numerous and narrower, the spire more turritid and distinctly concave-sided above, the surface smoother and the coloration different. Eleven specimens, of which three are mature, are before me. The old shells lack the initial whorl or two, and do not show the rich coloration of the younger specimens; and the change of contour from young to old is unusually marked.

*B. LIMENSIS* Reeve. Pl. 50, fig. 37.

Shell umbilicated, oblong-turritid, rather solid, longitudinally striated, obsoletely malleated; fleshy-whitish, variegated with reddish streaks. Spire turritid, the apex corneous, rather acute. Whorls 7, rather convex, the last rounded, about three-sevenths the total alt., slightly compressed around the narrow, open umbilicus.

Aperture oblique, oval, the peristome simple, unexpanded; acute, terminations converging; columellar margin broadly reflexed. Alt. 17, diam. 8; length of aperture  $7\frac{1}{2}$ , width inside  $4\frac{1}{2}$  mill. (*Pfr.*).

*Lima, Peru* (Paz, Cuming); and *Quito, Ecuador* (Cuming).

*Bulimus limensis* REEVE, Conch. Icon., pl. 77, f. 563 (August, 1849).—*PFR.*, Monogr., iii, p. 429.—*HIDALGO*, Journ. de Conch., 1875, p. 130.

*B. QUITENSIS* Pfeiffer. Pl. 51, figs. 16, 17, 18, 19.

Shell narrowly umbilicated, ovate-conic, somewhat solid, not shining, closely and irregularly rugulose-striate; whitish or pale brownish, ornamented with unequal brown or chestnut streaks. Spire conic, acute; suture simple; whorls 7 to 8, rather flat, moderately increasing, the last convex, not descending in front, rotund at base or lightly compressed. Columella subvertical, slightly arcuate, whitish or blackish-chestnut.

Aperture oval, acuminate above, rounded below, very rarely subangulate, concolored inside, one-half the length of the shell; peristome simple, unexpanded, acute, the right margin regularly arcuate, usually with a blackish-chestnut border within; columellar



margin dilated above, vaultingly reflexed, half-covering the umbilicus. (*Hidalgo*).

Alt. 29, diam. 14 mill. (*Hid.*).

Alt. 26, diam. 12 mill.; aperture 14 mill. long, 6 wide inside. (*Pfr.*).

*Quito* (Delattre); *Ibarra and Otavalo* (Martinez); *Pasto* (Lehmann), *Ecuador*.

*Bulimus quitensis* PFR., P. Z. S., 1847, p. 230; Monogr., ii, p. 182.—REEVE, Conch. Icon., pl. 48, f. 317.—HIDALGO, Viaje al Pacifico, p. 130, pl. 7, f. 5-8; Journ. de Conchyl., 1870, p. 63.—DKR., Jahrb. d. D. M. Ges., ix, 1882, p. 379.

Hidalgo describes the following varieties of coloring:

Var.: Shell brown, generally somewhat violaceous on the spire, not streaked or indistinctly so, the aperture entirely blackish-brown within (figs. 18, 19).

Var.: Shell almost unicolored, whitish.

The figure given by Reeve is said by Hidalgo to represent a slightly deformed individual, the subangulate character of the basal lip being abnormal. Figures 16, 17 represent the ordinary form.

The shell resembles *B. catlowiæ* Pfr., and as the apex is unknown, it may prove to be a *Scutalus*. I have not seen the species.

B. CEROPLASTA n. sp. Pl. 50, figs. 38, 39.

Shell perforated, ovate-conic, thin, somewhat translucent, waxen white. Surface shining, with irregular fine wrinkles of growth. Spire stout, conical, the apex obtuse, smooth. Whorls  $6\frac{1}{2}$ , the first obtuse above with comma-shaped apical pit, the next very convex; following whorls moderately convex.

Aperture irregularly ovate, narrow above, one-half the length of shell, white within. Outer lip gently and regularly arcuate, thin and acute. Columella straight, vertical, its edge broadly and flatly dilated, appressed above the umbilical perforation. Parietal wall convex, with a very light callus.

Alt.  $19\frac{1}{2}$ , diam. 10, alt. of aperture 9 mill.

Alt.  $20\frac{1}{2}$ , diam.  $10\frac{1}{2}$ , alt. of aperture 10 mill.

*Balsas, valley of Marañon River, Peru* (H. W. Webb).

The wax-like texture of this species is unusual in the group, although equally thin species inhabit Argentina. The inornate surface, straight (or even convex) columellar edge, and very narrow umbilicus are other characteristic features.

**B. ACALLES** Pfeiffer. Pl. 50, figs. 53, 54.

Shell subperforate, ovate-conic, thin, longitudinally closely striate and distantly plicate, scarcely shining, tawny-gray. Spire conic, rather obtuse, tawny. Whorls  $4\frac{1}{2}$ , slightly convex, the last longer than the spire, rotund at base. Columella slightly arcuate, somewhat receding. Aperture oblique, oval, tawny-flesh colored inside; peristome simple, unexpanded, the right margin arcuate, columellar margin reflexed above, somewhat adnate. Alt. 10, diam. 6 mill.; aperture  $6\frac{1}{2}$  mill. long, 4 wide. (*Pfr.*)

*Peruvian Andes* (Cuming coll.).

*Bulimus acalles* PFR., P. Z. S., 1851, p. 258; Conchyl. Cab., p. 84, pl. 30, f. 27, 28 (young); Monographia, iii, p. 410; iv, 479; vi, 126.

The types and only figured specimens were young. Pfeiffer subsequently described the adult as perforate, with 5 whorls, the last slightly longer than spire. Alt. 14, diam  $7\frac{1}{2}$  mill.; aperture  $7\frac{1}{2}$  mill. long, 4 wide.

**B. EROSUS** Broderip. Pl. 49, figs. 34, 35, 36.

Shell rimate-umbilicate, ovate-conic, rugose-striate, shining; opaque white, with scattered corneous dots. Spire conic, the apex obtuse, pale corneous. Whorls 6, convex, the last about as long as the spire. Columella arcuate. Aperture oval, very pale brown inside; peristome acute, sublabbiate, the columellar margin broadly reflexed, free, horizontally adnate above. Length 23, diam. 12; aperture 12 mill. long,  $6\frac{1}{2}$  wide. (*Pfr.*)

*Iquiqui, Peru* (Cuming).

*Bulinus erosus* BROD., P. Z. S., 1832, p. 106.—*Bulinus arrosus* SOWB., Conch. Illustr., f. 34.—*Bulimus erosus* PFR., Monogr., ii, p. 225; Conchyl. Cab., p. 236, pl. 63, f. 5, 6.—REEVE, Conch. Icon., pl. 22, f. 140.

The detail of character is not much unlike that of *B. conspersus*, but it is a shell of larger size and much more solid growth. (*Rve.*)

**B. CONSPERSUS** Sowerby. Pl. 49, fig. 27.

Shell ovate-subacuminate, thin, corneous, the apex a little obtuse. Whorls 6, rounded, guttate and lineated with whitish. Aperture ovate, of the same color; peristome acute, thin; umbilicus small. Length .65, diam. .4 inch. (*Sowb.*)

*Near Lima, Peru* (Cuming, Beechey, Paz).

*Bulinus conspersus* SOWB., P. Z. S., 1833, p. 73; Zool. Beechey's Voy., p. 145, pl. 38, f. 17; Conch. Illustr., f. 49.—*Bulimus conspersus* PFR., Monogr., ii, p. 190.—HIDALGO, Viaje al Pacif., p. 125; Journ. de Conch., 1870, p. 60.—? *B. conspersus* RVE., Conch. Icon., f. 137.

Sowerby, in his original description, mentions two forms of this species, one more ventricose than the other. Reeve has called the stouter form *B. coagulatus*; but Hidalgo reunites the two. The series of *coagulatus* before me shows no slender individuals; but I have not been able compare Reeve's form with *conspersus*, as that species is not represented in our collection.

*B. COAGULATUS* Reeve. Pl. 49, figs. 30, 31.

Shell narrowly umbilicated or perforate, *globose-ovate*, thin; white, densely mottled with corneous or corneous-brown oblique streaks and short transverse marks, or corneous-brown, with opaque white, obliquely transverse markings. Surface shining, with irregular wrinkles of growth. Spire short, conic, apex corneous, smooth. Whorls 5, the earlier slightly convex, last  $1\frac{1}{2}$  convex, the body-whorl globose.

Aperture over half the length; outer lip thin, acute; columellar lip thin below, with a short triangular reflection above; parietal callus very slight.

Alt.  $16\frac{1}{2}$ , diam. 12 mill.

Alt.  $13\frac{1}{2}$ , diam.  $9\frac{1}{3}$  mill.

*Lima, Peru* (Bland).

*B. coagulatus* RVE., Conch. Icon., pl. 77, f. 558.—PFR., Monogr., iii, p. 418.

Quite thin and much inflated. Hidalgo unites the species with *B. conspersus* Sowb., but the specimens before me look much more globose.

*B. MODESTUS* Broderip. Pl. 47, figs. 82, 69, 70.

Shell umbilicate, ovate-pyramidal, rather thin. Surface *sculptured with thread-like, raised whitish and rather coarse striæ*, rarely with traces, in some places, of spiral incised lines cutting them, or of spiral series of short wrinkles, visible only under the lens. *Color whitish-brown, with oblique streaks of dark, dull brown in the typical form*; (but in a variety *rusty brown, cut into zones by narrow spiral whitish bands* or lines, the brown zones further interrupted by whitish oblique streaks. Sometimes light spirals are absent). Spire elevated,



several earlier whorls smooth, glossy and corneous. Whorls about  $6\frac{1}{2}$ , quite convex, the sutures deep.

Aperture less than half the total length, ovate, inside brownish or showing the external markings. Outer lip thin, unexpanded; columella somewhat concave; columellar lip dilated above, whitish or brown. Parietal callus extremely thin.

Alt. 20, diam.  $11\frac{1}{2}$  mill.

*Huacho and Lima, Peru, on hills under stones.*

*Bulinus modestus* BROD., P. Z. S., 1832, p. 106.—SOWB., Conch. Ill., f. 19.—*Bulimus modestus* DH. in Lam., An. s. Vert., viii, p. 274.—REEVE, Conch. Icon., f. 109.—PFR., Monogr., ii, p. 207; vi, p. 139; Conchyl. Cab., p. 224, pl. 62, f. 3, 4.—HIDALGO, Journ. Conch. 1870, p. 53.—*Bulinus striatulus* SOWB., P. Z. S., 1833, p. 73; Conch. Illustr., f. 58.—*Bulimus striatulus* DESH. in Lam., viii, p. 270; and in Fér., Hist., p. 82, pl. 150, f. 24, 25.—REEVE, Conch. Icon., f. 143a (figure of Sowerby's type). Not *Bulimus striatulus* Lam.—*B. philippii* PFR., Symbolæ ii, p. 120; Monogr., ii, p. 208; vi, p. 139; Conchyl. Cab., p. 226, pl. 62, f. 9, 10.—HIDALGO, Viaje al Pacif., p. 89 (includes *striatulus* and *modestus*).—*B. orbignyi* PFR., P. Z. S., 1846, p. 31; Monogr., ii, p. 208.—Conf. REEVE, C. Icon., f. 143b, figure of type.

The prominent features of *B. modestus* are its rather turritid form, and raised, thread-like striæ, which are, however, often quite irregular in degree of development on different parts of the shell, and vary from whitish to the tint of the ground-color. The dull, brown-streaked coloring is also characteristic. In *B. striatulus* and *orbignyi* this is varied by spiral whitish bands; but I quite agree with Hidalgo that the several forms are specifically identical, the series before me well connecting them. The banded form is from Lima (Cuming, Paz, Martinez and de Lattre).

B. DELICATULUS Philippi. Pl. 47, figs. 87, 88.

Shell umbilicate-perforate, ovate-conic, very thin. Pale corneous, ornamented with white, slightly raised, delicate folds, which in places are confluent; whorls of spire having three or four ill-defined corneous transverse lines. Whorls 6, a little convex, the last little longer than the spire; apex rather obtuse, very smooth; suture moderately deep. Aperture ovate; columella a little straightened, the peristome unexpanded, thin, right margin arcuate, columellar

margin dilated above, vaultingly reflexed. Alt. 17, diam. 11 mill.; aperture 9 mill. long,  $5\frac{1}{2}$  wide. (*Phil.*).

"*Hacienda de Unigambal*," Peru (Raimondi).

*Bulimus delicatulus* PH., Malak. Bl., xiv, 1867, p. 73.—PFR., Novit. Conch., iii, p. 335, pl. 80, f. 8, 9.

The distinct though narrow umbilicus and the sculpture separates it from *B. translucens* and *B. fourmiersi*.

*B. SORDIDUS* Lesson. Pl. 47, fig. 83.

Shell umbilicated, ovate-pyramidal, thin; coarsely striate obliquely, *the striae broken into oblong granules* on middle and upper part of body-whorl and the next earlier whorl. Dull light brown, with several spiral whitish lines. Whorls  $6\frac{1}{2}$ , convex, the earlier smooth, glossy and brown.

Aperture ovate, outer lip thin, columellar lip broadly dilated above, white. Alt.  $23\frac{1}{2}$ , diam. 14; alt. of aperture 12 mill.

*Mt. St. Christoval, near Lima* (Lesson).

*Helix sordidus* LESS., Voy. de la Coquille, ii, pt. 1, p. 315, pl. 13, f. 3. Not *Helix sordida* Pfr., 1842.—*Bulimus sordidus* POT. & MICH., Galerie., i, p. 155, pl. 15, f. 11, 12.—ORBIGNY, Voy. Am. Mérid., p. 281.—PFR., Monogr., ii, p. 188; Conchyl. Cab., p. 63, pl. 18, f. 7-9.—REEVE, Conch. Icon., f. 401 (not f. 100). Not *Bulinus sordidus* King (1831), see this vol. p. 51.

This species differs from *B. modestus* mainly in its granulose striae. As its name preoccupies that of a species subsequently proposed by Pfeiffer, the latter may be called *H. subsordida*.

*B. GUTTATUS* Broderip. Pl. 47, figs. 76, 77, 78.

Shell subperforate, ovate-fusiform, rugulose-striate, thin, pellucid corneous, *variegated with opaque white streaks* and blotches. Spire conic, *the apex papillar*. Whorls 7, a little convex, the last about equal in length to the spire. Aperture oval; peristome unexpanded, acute, the columellar margin dilated above, vaulted and reflexed, nearly closing the perforation. Alt. 18, diam. 8 mill.; aperture 10 mill. long, 5 wide. (*Pfr.*).

*Cobija, Chili* (Cuming).

*Bulinus guttatus* BROD., P. Z. S., 1832, p. 31.—SOWB., Conch. Illustr., f. 10.—*Bulimus guttatus* DESH. in Lam., An. s. Vert., viii, p. 271.—REEVE, Conch. Icon., f. 144.—PFR., Monogr., ii, p. 177; iii, 410; vi, 112.—HUPE in Gay's Historia de Chile, viii, p. 111, pl. 1, f. 5.

B. JUANA Cousin. Pl. 1, fig. 9.

Shell umbilicated, ovoid, and conic above; quite thick and dull; ashy-white, with three small tawny-brown bands, one at the suture, the others submedian; surface ornamented with irregular growth-striæ which are quite spaced and projecting. Whorls  $7\frac{1}{2}$ , slowly and regularly increasing, separated by an impressed suture; two earlier whorls smooth, and with the following two corneous-brown; following whorls of spire with two brown bands. Last whorl plainly carinated around the quite large and deep umbilicus.

Aperture oval, interrupted by the preceding whorl; peristome thin, sharp, the upper insertion a little above the lower band; columellar margin straight, with the traces of a canal at its union with outer lip. Alt. 20-23, diam. 10-11; alt. of aperture 10, width 7 mill.

*Gualacco, province of Cuenca, Ecuador* (Cousin).

*Thaumastus juana* COUSIN, Bull. Soc. Zool. France, xii, p. 228, pl. 4, f. 10 (April 1, 1887).

Description abridged from Cousin.

B. LAURENTII Sowerby. Pl. 50, figs. 47, 48, 49, 50.

Shell umbilicated, ovate-pyramidal, thin; whitish with (1) numerous (about 6) spiral brown bands (continuous or broken into a tessellation), or (2) brown with darker streaks and a few median and basal white spirals, or (3) unicolored white. Surface hardly shining, smooth except for faint growth-wrinkles. Whorls 6, convex, the apex smooth.

Aperture ovate, less than half the length of shell, showing the external coloring within. Outer lip thin; columellar lip dilated above.

Alt.  $15\frac{1}{2}$ , diam. 9; alt. of aperture  $6\frac{1}{2}$  mill.

Alt.  $14\frac{3}{8}$ , diam. 8; alt. of aperture 6 mill.

*Island of San Lorenzo, Bay of Callao, Peru* (Cuming and others); *Cero de las conchitas, near Lima* (Paz).

*Bulinus laurentii* SOWB., P. Z. S., 1833, p. 37.—*Bulinus laurentii* PFR., Monogr., ii, p. 213; Conchyl. Cab., p. 231, pl. 62, f. 28-30.—DESH. in FÉR., Hist., p. 86, pl. 157, f. 26-28.—REEVE, Conch. Icon., f. 119.—HIDALGO, Journ. de Conch., 1870, p. 60.—*B. lorentzii* ORB., Voy, p. 281.—POT. & MICH., Galerie, i, p. 146, pl. 13, f. 13, 14.

With the form of *B. modestus*, this species lacks the coarse striation and is constantly much smaller. The color-patterns are numerous.



*B. SCUTULATUS* Broderip. Pl. 47, figs. 71, 72, 73.

Shell umbilicate, ovate-turritid, *solid*; *opaque white, with several (5 to 7) spiral chestnut bands formed of closely arranged, square or narrow spots*; the earlier whorls yellowish, brown or whitish. Surface with irregular growth-wrinkles. Spire elongated, apex mamillar, smooth. Whorls  $7\frac{1}{2}$ –8, convex, especially below the sutures.

Aperture oblong-ovate, less than half the total length, showing the bands within. Outer lip sharp, columellar lip straightened, broadly dilated above. Alt. 24, diam. 12; alt. of aperture 10 mill.

*Islay, Peru (Cuming).*

*Bulinus scutulatus* BROD., P. Z. S., 1832, p. 106.—*Bulimus scutulatus* ORB., Voy., p. 282.—DESH. in An. s. Vert., viii, p. 265.—PFR., Monogr., ii, p. 213; Conchyl. Cab., p. 223, pl. 62, f. 1, 2.—HUPE in Gay, Hist. Chile, viii, p. 112, pl. 2, f. 5.—REEVE, Conch. Icon., f. 110.

The solidity of this species distinguishes it from *B. modestus* group. There is much variation in coloring, some specimens being very pale.

I refer to this species a very slender shell, alt.  $23\frac{1}{2}$ , diam. 10 mill., which has the same coloration.

*B. LIMONICUS* Orbigny. Pl. 50, figs. 42, 43.

Shell elongated, pyramidal, subumbilicated, thin, substriate; translucent, whitish-rufescent, varied with narrow brown longitudinal lines. Spire subinflated, the apex acute. Whorls 6, rounded, short. Aperture oval, angulose; lip thin, acute. Alt. 16, diam. 7 mill. (*Orb.*).

*Southeastern part of Prov. Chiquitos, Bolivia, at the ruins of the ancient mission of San Juan (Orb.).*

*Helix limonoica* ORB., Mag. de Zool., 1835, p. 13.—*Bulimus limonoicus* ORB., Voy., p. 284, pl. 33, f. 15–17.—PFR., Monogr., ii, p. 111.—? *B. limonoicus* REEVE, Conch. Icon., pl. 56, f. 371.—? *B. limonoicus* PFR., Monogr., iii, p. 425.—*B. cinereus* REEVE, Conch. Icon., pl. 56, f. 372.

This species has some resemblance to *B. scutulatus*; but it is distinguished by the visibly swollen spire, more elongated, by the narrower and angular aperture, smoother texture, and finally the completely different tint. However, it should be placed near *B. scutulatus*. (*Orb.*).

*B. FLAGELLATUS* n. sp. Pl. 50, figs. 44, 45.

Shell umbilicated, ovate-oblong, solid opaque and earthy, white with irregularly spaced dull reddish or purplish longitudinal streaks, sometimes wanting. Surface lusterless, with weak, coarse indistinct growth-wrinkles. Spire long, the apex obtuse and smooth. Whorls  $7\frac{1}{2}$ , quite convex, the last very convex. Sutures deeply impressed. Umbilicus rather narrow, often purplish inside.

Aperture contained about  $2\frac{1}{2}$  times in length of shell, short, oval, rose-purple or white within; peristome simple and unexpanded, the columellar margin dilated above, white, fleshy or purplish; parietal callus thin.

Alt. 25, diam. 12, alt. of aperture 10 mill.

Alt. 20, diam. 9, alt. of aperture  $7\frac{1}{2}$  mill.

*Balsas, valley of Marañon R., Peru (H. W. Webb).*

A very solid, earthy shell, irregularly streaked with light reddish, and often with some purplish streaks. Besides the tray of 5 typical specimens from Balsas, we have a series of 7 without other locality than "Peru." These are white, a few showing some streaks just behind the lip; the apertures dull purplish or nearly white. With the general figure of *B. limonoicus* Orb., this is a much more solid species, larger, and with more whorls. *B. scutulatus* is closely allied, but in that the aperture is much narrower in proportion to its length, and the columellar lip of a very different shape. *B. andicola* Pfr., a similarly marked species, has the spire more slender and is said to be sculptured with close concentric lines.

*B. ANDICOLA* Pfeiffer. Pl. 50, fig. 46.

Shell perforate, turritid-conic, solid; seen under the lens to be sculptured with close concentric lines; opaque, shining; white, irregularly ornamented with brown linear streaks. Spire lengthened, rather acute. Whorls 7, a little convex, the last about equal to three-sevenths the shell's length, rotund at base. Columella a little receding below. Aperture oval-oblong, the peristome simple, acute, columellar margin vaultingly reflexed above, forming a narrow perforation. Alt. 24, diam. 11 mill.; aperture, alt. 11, width  $5\frac{1}{2}$  mill. (Pfr.).

*Andes of Bolivia (Cuming coll.).*

*Bulimus andicola* PFR., P. Z. S., 1846, p. 115; Monogr., ii, p. 214; vi, 143.—REEVE, Conch. Icon., pl. 55, fig. 364.

Very similar to *B. albatrus*, mainly differing in the punctiform perforation (*Pfr.*). A variety with more or less distinct transverse bands is mentioned by Pfeiffer. Reeve gives an erroneous locality.

*B. RAIMONDIANUS* Pilsbry, n. n. Pl. 50, fig. 40.

Shell openly perforate, oblong-conic, solid, irregularly striate, white (rarely with one or more rufous lines); spire turritid-conic, acute. Whorls 7, convex, separated by deep sutures, the last about three-fourths the length of the spire. Columella slightly arcuate. Aperture oblong-oval; peristome simple, unexpanded, the columellar margin dilated, not closing the perforation. Alt.  $20\frac{1}{2}$ , diam.  $10\frac{1}{2}$  mill.; aperture 10 mill. long,  $5-5\frac{1}{2}$  wide. (*Phil.*)

*Between Mayoc and Huanta, Peru (Raimondi).*

*Bulimus spretus* PHIL., Malak. Bl., xvi, 1869, p. 34.—PFR., *ibid.*, p. 89; Novit. Conch., iii, p. 471, pl. 102, f. 11; Monogr., viii, p. 171. Not *Bulimus spretus* Reeve, 1850.

Differs from *B. confusus* Reeve in the smaller size, more conic form, lower whorls, and less oblique sutures; from *B. turritella* Orb. by the solid shell. *B. turritella* is a species of the "*caliente*" region, *spretus* of the frigid "*Sierra*" (*Phil.*).

*B. ULLOÆ* Philippi. Pl. 50, fig. 41.

Shell covered-perforate, oblong pyramidal, somewhat roughened by longitudinal striæ; white. Spire conic. Whorls 6, a little convex, separated by moderately deep sutures, the last about equal in length to the spire. Columella subvertical. Aperture patulous, oblong-ovate; peristome simple, thin, the right margin unexpanded, columellar margin a little expanded, covering the perforation. Alt.  $16\frac{1}{2}$ , diam.  $6\frac{1}{2}-7\frac{1}{2}$  mill.; aperture 8 mill. long,  $4-4\frac{1}{2}$  wide. (*Phil.*)

*"Quebrada caliente," between Mayoc and Huanta, Peru.*

*Bulimus ulloæ* PHIL., Malak. Bl., xvi, 1869, p. 34.—PFR., Novit. Conch., iii, p. 471, pl. 102, f. 9, 10; Monogr., viii, p. 155.

The three specimens seen by Philippi differ a little in diameter but are of the same length; all are rugulose, destitute of epidermis, with the apices roseate. In size and form they agree pretty well with *B. limonoicus* Orb., but they lack brown longitudinal lines, the whorls are neither "*étroits*" nor "*séparés par une suture peu profonde*," the suture being quite deep. It does not agree with *B. pazianus* Orb.



**B. APERTUS** Pfeiffer. *Unfigured.*

Shell umbilicated, ovate-conic, solid; sculptured with close, strong folds, which become evanescent on the last whorl; little shining, whitish. Spire regularly conic, the apex corneous, somewhat acute. Whorls 7, convex, the last about three-sevenths the total length, sub-compressed around the open, pervious umbilicus.

Aperture little oblique, oval; columella subPLICATE above, sub-angulately arcuate; peristome simple, the margins converging, the right margin unexpanded, columellar margin dilated, spreading. Alt. 19, diam. 10; aperture  $8\frac{1}{2}$  mill. long, 5 wide. (*Pfr.*).

*Habitat unknown.*

*Bulimus apertus* PFR., Malak. Bl., ii, 1855, p. 107; Monogr., iv, p. 492.

Referred by Pfeiffer to *Rhabdotus*, but its systematic position is uncertain. In a later volume of the Monographia the locality "Peru?" is given.

**B. TUMIDULUS** Pfeiffer. Pl. 49, figs. 28, 29.

Shell nearly covered perforate, ovate-acuminate, thin, striatulate, shining; whitish, banded with chestnut denticulate lines and interruptedly streaked. Spire conic, somewhat mucronate, the mucro corneous. Whorls 7, flattened, the last swollen, as long as the spire. Columella rather straight, surrounded by a reddish area.

Aperture oval, colored within like the outside; peristome simple, acute; columellar margin reddish, reflexed, nearly closing the perforation. Alt. 23, diam. 12 mill.; aperture 13 long, 7 wide. (*Pfr.*).

*Ambo*, (Cuming); and *Huanuco* (Angrand), *Peru*.

*Bulinus inflatus* BROD., P. Z. S., 1836, p. 45.—SOWB., Conch. Illustr., f. 61. Not *Bulimus inflatus* Lam.—*Bulimus tumidulus* PFR., Symbolæ, ii, p. 123; Monogr., ii, 193.—REEVE, Conch. Icon., pl. 19, f. 111a, b.—DESH. in Fér., Hist., p. 89, pl. 157, f. 16–19.—MORELET, Sér. Conch., iii, p. 194.

Besides the typical coloring described above (fig. 29), there is a fleshy-whitish form with a few reddish lines and series of ruddy dots (fig. 28), and a bandless white form, fawn-tinted at the base.

**B. VIRGULTORUM** Morelet. Pl. 49, figs. 15, 16, 17, 18, 19, 20, 21, 22.

Shell moderately umbilicated, ovate-conic, rather thin, shining, obsoletely costulate-striate; whitish or pale tawny-buff, variously

ornamented with continuous or interrupted bands. Spire conic, rather acute, roseate or brownish above. Whorls 7, slightly convex, the last slightly shorter than the spire, slightly compressed around the umbilicus, and marked with a wide brown band.

Aperture little oblique, oval, the peristome simple, thin, right margin arcuate, slightly expanded, columellar margin dilated, spreading. Alt. 31, diam. 14 mill.; aperture 15 mill. long, 9 wide. (*Morel.*).

*Valley of Santa Anna, eastern slope of the Cordillera, Peru (Angrand).*

*Bulimus virgultorum* MOREL., Sér. Conch., iii, p. 194, pl. 10, f. 1. PFR., Monogr., vi, p. 134.

The prevailing color-patterns are: (a) unicolored whitish or roseate. (b) Whitish, with one or many interrupted or continuous bands. (c) Pale buff, obliquely striate with brown. (d) Pale buff, marbled and latticed with chestnut.

The interior of the aperture is a pale fallow tint; and on the shell may be seen some vestiges of the punctation observed in several Peruvian species. The bands vary from none to eight; the one below the periphery and passing into the aperture, and that bordering the umbilicus, ordinarily are continuous, the latter being the most persistent. The unicolored rose variety is rare. It seems to be allied to *B. pictus* Pfr.

This may belong to *Drymæus*.

B. SCALARIFORMIS Broderip. Pl. 47, figs. 79, 80, 81.

Shell umbilicated, ovate-pyramidal, rather thin; opaque; unicolored white, or whitish with dull brown spiral bands, or dull brown with a darker umbilical crescent and whitish striæ. Surface lusterless, *closely sculptured with regular longitudinal riblets* as wide as their intervals, except on several earlier whorls. Spire conic, the apex obtuse, smooth, clear whitish, corneous or orange. Whorls 5-5½, very convex, separated by deep sutures. Umbilicus rounded, generally rather large.

Aperture ovate, less than half the length of the shell, brownish or white within. Terminations of peristome somewhat approaching; columella much less curved than outer lip; columellar lip expanded above.

Alt. 12, diam. 7; alt. of aperture 5.5 mill.

Alt. 11, diam. 7.6; alt. of aperture 4.8 mill.

Alt. 10, diam. 5; alt. of aperture 4 mill.

*Arcon* (Cuming); *Lima* (Orb., Paz); *Chanéay* (Rev. J. M. Thompson), *Peru*.



*Bulinus scalariformis* BROD., P. Z. S., 1832, p. 31.—SOWB., Conch. Illustr., f. 13; Zool. Beechey's Voy., p. 144, pl. 38, f. 12.—*Bulimus scalariformis* ORB., Voy., p. 282.—DESH. in An. s. Vert., viii, p. 272; in Fér., Hist., p. 87, pl. 157, f. 29–31.—REEVE, Conch. Icon., f. 129.—PFR., Monogr., ii, p. 217; vi, p. 140; Conchyl. Cab., p. 229, pl. 62, f. 19–21.—HIDALGO, Journ. de Conch., 1870, p. 54; Viaje al Pacif., p. 91.

*B. scalariformis* is well-named, having much the aspect of a stout, fine-ribbed *Scalaria*. It varies to an extraordinary degree in form, specimens from some localities being far wider in proportion to their length than others. To a less extent it varies in coloring. The sculpture of close, regular, rounded riblets is characteristic of all specimens, however, so that it is readily identified. *B. scalariformis* is a common species in collections.

*B. RUSTICELLUS* Morelet. Pl. 49, figs. 23, 24.

Shell umbilicated, ovate-acuminate, rather solid, irregularly rugulose-striate, here and there subgranulate, scarcely shining, white; the spire projecting, acutely conical, apex smooth, pale corneous. Whorls 6, convex, the last inflated, rounded at base, a little longer than the spire; aperture little oblique, acutely ovate, fulvous within; peristome simple, unexpanded, the margins converging, joined by a callus; columellar margin narrowly dilated above and reflexed. Alt. 20, diam.  $10\frac{1}{2}$  mill. (*Morel.*).

*On the ruins surmounting the hills around the valley of Jauja, and (somewhat smaller and slightly more elongated specimens) from Pomacocha, Peru (Angrand).*

*Bulimus rusticellus* MOREL., Journ. de Conch., viii, p. 373 (1860); Séries Conchyl., iii, p. 185, pl. 8, f. 5.—PFR., Monogr., vi, p. 124.

In form, this species has some resemblance to *B. scalariformis*, which inhabits the same country, but not the same tract. It is a larger species. The whorls of the spire, 6 in number, enlarge gradually, producing an acute and long cone, the last whorl, however, enlarges considerably, so as to constitute two-thirds of the shell. The suture is distinct, the umbilicus narrow, not deep, half covered by the columellar expansion.

*B. DEVIANS* Dohrn. *Unfigured.*

Shell covered-perforate, oblong-turritid, rather thin, sculptured with growth-striae, shining, bluish. Spire turritid, the apex rufous-



or blackish-brown, obtuse. Suture impressed. Whorls 5, moderately convex, rapidly increasing, the last not descending in front, more convex, inflated, rotund. Aperture slightly oblique, acuminate-oval, brown within; peristome acute, unexpanded, margins joined by a thin callus, the right margin simple, columellar margin reflexed, half-covering the perforation. Alt. 15, diam. 6 mill.; aperture 7 mill. long,  $4\frac{1}{2}$  wide. (*Dohrn*).

*Peru.*

*Bulimulus devians* DOHRN, Malak. Bl., x, 1863, p. 155.—PFR., Monogr., vi, p. 118.

The three examples examined agree in the main, but one has the spire somewhat stouter and the last whorl less conspicuously inflated. It is not closely allied to any species known to me. The aperture happens to be formed as in *B. stenacme* Pfr., which, however, is similar neither in form nor color. The apex is quite obtuse, earliest whorls blue-black or brown, beyond these the rapidly increasing whorls are gray-blue somewhat streaked, the dark brown underlying layer showing through in a few places. The suture is rather deeply impressed, so that the spire seems somewhat convex. As far as the middle of the last whorl the breadth increases regularly; then the whorl becomes swollen and decidedly more convex, giving the shell the appearance of being obliquely produced to the right. The aperture is simple, with sharp lips, dark brown inside, columellar margin narrowly reflexed, so that the umbilicus is half covered (*Dohrn*).

*B. EXORNATUS* Reeve. Pl. 50, fig. 55.

Shell subperforate, ovate-conic, thin, irregularly striate, painted with narrow, denticulate streaks of rufous-corneous and whitish. Spire long-conic, reddish above, the apex rather acute. Whorls 7, moderately convex, the last about three-sevenths the alt., a little compressed at the base. Columella vertical. Aperture slightly oblique, oblong; peristome simple, acute, the columellar margin narrowly reflexed. Alt. 15, diam.  $6\frac{1}{2}$  mill.; aperture  $6\frac{1}{2}$  mill. long, 3 wide. (*Pfr.*).

*Chilon, Bolivia*, under dead trunks of cacti (*Bridges*).

*Bulimus exornatus* REEVE, Conch. Icon., pl. 77, f. 560 (August, 1849).—PFR., Monogr., iii, p. 410.—*Otostomus (Mormus) exornatus* H. AD., P. Z. S., 1866, p. 442.

"Of transparent horny texture, neatly marked with opaque white longitudinal lines." Reported from eastern Peru by H. Adams, Bartlett coll.

*Group of B. derelictus.*

Outer lip well expanded. Surface more or less decussated.

**B. DERELICTUS** Broderip. Pl. 48, figs. 91, 92.

Shell with *ample and deep umbilicus*, ovate-conic, solid, opaque, whitish with fleshy narrow streaks or conspicuous, corneous-brown streaks interrupted with white flecks and striae, the brown sometimes much predominating. Surface with growth-wrinkles and some decussating spiral incised striae; lusterless. Spire conic, concave above, the apex mamillar, white or roseate, smooth. Whorls 6, convex, the last subangular around the large umbilicus.

Aperture ovate, *oblique*, over half the total length of shell, white or fleshy within; *outer lip broadly expanded*, somewhat flattened, white. Columella concave, columellar lip broadly dilated above; *terminations of peristome much converging*.

Alt. 25, diam. 16 mill.

Alt. 22½, diam. 16 mill.

Alt. 20½, diam. 12½ mill.

*Cobija, Chili* (Cuming, Orbigny, Paz).

*Bulinus derelictus* BROD., P. Z. S., 1832, p. 107.—SOWB., Conch. Illustr., f. 38.—*Bulimus derelictus* ORB., Voy. dans l'Amér. Mérid., p. 306.—PFR., Monogr., ii, p. 63; vi, 43.—DESH. in Fér. Hist., p. 69, pl. 139, f. 4, 5.—REEVE, Conch. Icon., f. 151.—HIDALGO, Mol. Viaje al Pacif., p. 88.—POR. & MICH., Galerie, i, p. 139, pl. 14, f. 13, 14.—*Bulimus curtus* KOCH, in Philippi, Abbild. u. Beschreib., i, p. 158, pl. 2, f. 8.

Well distinguished by the oblique aperture, flaring, subreflexed outer lip and mamillar apex. The latter is smooth, showing the species to be a *Lissoacme*, not a *Scutalus*.

**B. UMBILICATUS** Miller. Pl. 48, figs. 93, 94, 95, 96.

Shell umbilicated, ovate-conic or oblong-conic, thin, closely wave-striate, with obsolete spiral lines, sometimes obsoletely carinated; pale tawny, sometimes obscurely three-banded. Spire convex-conic, attenuated above, the apex acute. Whorls 8½, planulate, the suture slight, at the last whorl crenulated and more distinctly separating; first whorl glabrous, the last whorl three-sevenths to one-half the length of shell; umbilicus perforated, columella straight, white.

Aperture suboval, slightly oblique, white inside; peristome simple, thin, acute, the right margin narrowly expanded and reflexed, arcu-

ate, protracted above; columellar margin broadly and triangularly dilated, adnate above; parietal callus almost lacking. (Miller).

Alt. 34, diam. 14; aperture 15-16 long, 8 wide (inside); whorls 8½.

Alt. 30, diam. 14; aperture 15 long, 7 wide (inside); whorls 8.

*Dry Mountains on Catamayo R., Prov. Loja, Ecuador, 2000-3000 ft. above sea-level (Wolf).*

*Thaumastus umbilicatus* MILL., Malak. Bl. (n. F.), i, p. 122, pl. 12, f. 5; pl. 13, f. 1.

*Group of B. erythrostomus.*

*B. ERYTHROSTOMUS* Sowerby. Pl. 48, figs. 1, 2, 97.

Shell with *large umbilicus, obesely ovate, solid, opaque and white*, with irregular indistinct fleshy or gray-blue streaks and *small scattered dots*, the latter translucent by transmitted light, these markings often inconspicuous; earliest whorls fleshy or corneous, smooth. Surface dull or slightly shining, with irregular wrinkles of growth, and seen under the lens to be *cut by superficial incised spiral lines into series of long granules*, often absent on middle and base of last whorl. Spire short, conic, composed of 5½-5¾ very convex whorls, separated by deep sutures. Last whorl rotund.

Aperture slightly oblique, round-ovate, over half the shell's length, crimson, rose or red-brown within, becoming light brown in the throat; lip moderately thick but sharp, not expanded, the edge light. Columella broadly dilated its inner edge straight or lightly concave; parietal callus thin, colored.

Alt. 24, diam. 17; alt. of aperture 14 mill.

Alt. 19½, diam. 13; alt. of aperture 10 mill.

Alt. 18, diam. 15; alt. of aperture 10½ mill.

*Huasco (Cuming) and Coquimbo (Paz), Chili.*

*Bulinus erythrostoma* SOWB., P. Z. S., 1833, p. 37; Conch. Ill., f. 50.—*Bulimus erythrostoma* Sow., DESH. in Lam. An. s. Vert., viii, p. 278.—REEVE, C. Icon., f. 75.—GAY, Hist. Chile, viii, p. 109, pl. 3, f. 3.—PFR., Monogr., ii, p. 190; vi, p. 128; Conchyl. Cab., p. 199, pl. 55, f. 9, 10.—*Bulimulus erythrostoma* Sowb., BECK, Index, p. 68.—*Bulimus erythrostomus* HIDALGO, Journ. de Conchyl., 1870, p. 54.

Very variable in size, width of umbilicus, and intensity of the aperture coloring. Fig. 97 is a stunted, blue-tinged form from Huasco, with very wide, deep umbilicus.



Var. *ALBUS* Sowerby. Pl. 48, figs. 98, 99.

Form, size and sculpture as in *erythrostomus*; but the spirals are less developed than in average *erythrostomus*, often almost obsolete. White, with faint bluish streaks, or longitudinally striped with corneous. Interior of aperture, the columellar expansion and parietal callus yellowish-white or light brown.

*Copiapo* (Cuming); *Questa de Arenas, near Huasco* (Bridges) *Chamarcillo and Coquimbo* (Paz) in sandy places, *Chili*.

*Bulinus albus* SOWB., P. Z. S., 1833, p. 73 (published Sept. 20, 1833); Conch. Illustr., f. 52.—*Bulimus albus* DESH. in Lam., An. s. Vert., p. 269.—ORB., Voy. dans l'Amér. Mérid., p. 280.—HUPE, in Gay, Historia de Chile, viii, p. 108, pl. 3, f. 5.—PFR., Monogr., ii, p. 190; vi, p. 125; Conchyl. Cab., p. 199, pl. 55, f. 11-14.—HIDALGO, Journ. de Conchyl., 1870, p. 54; Viaje al Pacif., p. 83.—*Bulimus olorinus* DUCLOS, in Guérin's Mag. de Zool., 1833, pl. 24.—*Helix olorinus* Orb., olim.—*Bulimulus albus* BECK, Index, p. 68.—? *Bulimus albicans* REEVE, Conch. Icon., pl. 22, f. 141.

The coloring of the aperture, upon which alone this species was based, is not likely to prove a character of specific value, in view of the wide variation observable in the numerous specimens of *B. erythrostomus* before me.

*B. HUASCENSIS* Reeve. Pl. 48, fig. 3.

Shell long-ovate, umbilicated, solid, opaque and white, with indistinct grayish streaks, or faintly pink with fleshy streaks. Surface with irregular, fine growth-wrinkles and subobsolete spiral incised lines above. Spire long, apex pink or corneous, obtuse, smooth. Whorls 6, convex, sutures deep.

Aperture half as long as shell, ovate, light yellowish-brown inside; lip thin and acute. Columella broadly dilated, whitish, its inner edge straightened. Parietal wall with a light wash of white callus.

Alt. 20, diam.  $12\frac{1}{2}$  mill.

*Huasco, Chili* (Bridges).

*Bulimus huascensis* REEVE, Conch. Icon., pl. 23, f. 147 (June, 1848).—DESH. in Fér., Histoire, ii, p. 85, pl. 150, f. 5, 6.—PFR., Monogr., iii, p. 431; vi, 143.

Like *B. albus* in texture, color, sculpture and umbilicus, but with the aperture smaller and form more slender. It will probably prove a varietal form.

*B. ALBICANS* Broderip. Pl. 48, figs. 4, 5.

Shell umbilicated, obese-ovate, rather thin; white with indistinct grayish streaks or closely speckled and streaked throughout with brown, the markings translucent by transmitted light, apex roseate or corneous. Surface with rather coarse, irregular growth-wrinkles, more or less plicate below sutures, and decussated above the middle by spiral incised lines, rather few and sometimes subobsolete. Spire conic, apex rather obtuse, smooth. Whorls  $5\frac{1}{2}$ , convex.

Aperture over half the alt., ovate, brownish inside; outer lip thin, sharp, unexpanded, often pinkish within. Columella dilated above, nearly straight, brownish or rose; parietal wall with almost imperceptible glaze. Alt. 16, diam. 11 mill.

*Chili: Copiapo* (Cuming); *Huasco* (Paz & Martinez); *San Lorenzo* (U. S. Expl. Exped.).

*Bulinus albicans* BROD., P. Z. S., 1832, p. 105 (published July 31, 1832) SOWERBY, Conch. Illustr., f. 22, 22\*.—*Bulinus albicans* DESH. in Lam., An. s. Vert. viii, p. 274.—POT. & MICH., Galerie, i, p. 135, pl. 14, f. 7, 8.—HIDALGO, Journ. de Conchyl., 1870, p. 52; 1875, p. 128.—PFR., Monogr., ii, p. 191; vi, p. 125.—HUPE in Gay, Historia de Chile, viii, p. 109, pl. 3, f. 6.—*B. spixii* P. & M., t. c., p. 155, pl. 15, f. 13, 14.—*B. conspersus* P. & M., t. c., in index, p. 19.—*B. albus* var. *albicans* HIDALGO, Viaje al Pacif., p. 84.—Not *B. albicans* Reeve.—*B. conspersus* var.  $\beta$  PFR., Monogr., ii, p. 191.

Decidedly smaller and thinner than well developed *B. albus* or *erythrostomus*, but some specimens of the latter I have seen approach *albicans* in stature. Hidalgo unites it with *B. albus* as a small variety. See remarks on the species of this group, above.

The shell may be either almost white or much streaked and angularly speckled, and the rose color of the mouth is often lacking, and when present not very strong.

*B. PRUINOSUS* Sowerby. Pl. 1, figs. 4, 5.

Shell umbilicated, ovate-conic, rather solid but thin; corneous, flecked and streaked with white, or opaque white flecked and streaked with corneous, the latter predominating on spire, earlier whorls smooth, corneous. Surface smoothish, with wrinkles of growth, and above the periphery cut into spiral series of long granules by spiral lines. Spire conic, the apex obtuse, smooth. Whorls  $5\frac{1}{2}$ , slightly convex, the sutures more or less crenulated.

Aperture half the total length (more or less), slightly oblique, ovate, white within; outer lip unexpanded, arcuate; columellar lip well dilated above. Alt.  $14\frac{1}{2}$ , diam.  $7\frac{1}{2}$  mill.

*Cobija* (Cuming), *Chili*.

*Bulinus pruinus* SOWB., P. Z. S., 1833, p. 36.—*Bulinus pruinus* PFR., Monogr., p. 198.—REEVE, Conch. Icon., pl. 20, f. 120.

The contour varies considerable, and sometimes opaque white, sometimes corneous is the prevailing color. Part of the specimens before me are marked "Peru," but it is doubtful whether they are from localities now in that State. Others are from Coquimbo.

B. ROUAULTI Hupé. Pl. 48, figs. 6, 7.

Shell perforate, ovate-conic, rather solid, slightly shining, closely striate, and very obsoletely decussated with some rather remote spiral lines. Dull opaque whitish, more or less irregularly maculated with pellucid-corneous, or corneous-pellucid with copiously scattered spots and streaks of opaque whitish. Spire conoid, the apex rather acute, corneous, smooth; suture simple. Whorls 5 to 6, slightly convex, moderately increasing, the last obliquely descending.

Aperture oval, colored within like the outside, about one-half the shell's length; peristome simple, acute, the ends joined by a very thin callus; right margin regularly arcuate, columellar margin dilated and reflexed above, partly closing the perforation; columella little oblique, lightly arcuate. Alt. 14, diam. 7 mill. (*Hidalgo*).

*Chili*, at *Copiapo* (Gay), and *Coquimbo*, among plants in sandy places (Paz).

*Bulinus rouaulti* HUPE in Gay, Historia de Chile, viii, p. 110, pl. 3, f. 8 (1854).—PFR., Monogr., iv, 478.—HIDALGO, Journ. de Conch. 1870, p. 54; Viaje al Pacifico, p. 86.

The more lengthened form and the shape of the aperture distinguish this from *B. albicans*, which is closely allied.

B. SIMPLICULUS Pfeiffer. *Unfigured*.

Shell perforate, conic-ovate, solid, rugulose-striate, obsoletely decussated with spiral lines, when seen under a lens, somewhat shining; white, with generally scattered pellucid dots. Spire convex-conic, the apex corneous, rather obtuse; suture minutely crenulated; whorls 6, moderately convex, the last a little shorter than spire, somewhat rounded at base.



Aperture slightly oblique, oblong-oval; peristome simple, unexpanded, the right margin lightly arcuate, columellar margin dilated, reflexed partly over umbilicus; columella somewhat straightened, subpubescent above. Alt.  $19\frac{1}{2}$ , diam.  $9\frac{1}{2}$  mill.; alt. of aperture 9, width 5 mill. (*Pfr.*).

*Habitat unknown.*

*Bulimus simpliculus* PFR., P. Z. S., 1854, p. 124; Monogr., iv, p. 490.

This unfigured species seems to belong to the Chilian group of *B. albicans*, but it is slenderer than the other described species.

*B. MEJILLONENSIS* Pfeiffer. Pl. 48, figs. 11, 12, 13, 14.

Shell narrowly umbilicate, oblong-ovate, solid; opaque-white, with irregular, interrupted corneous streaks, or uniform white. Surface lusterless, with irregular growth-wrinkles (and sometimes showing some faint incised spirals, or coarse malleation). Spire conic, with convex outlines, apex somewhat mamillar, whorls 6, convex.

Aperture slightly less than half the length of shell, long ovate; outer lip sharp, with a broad and rather heavy internal thickening. Columella slightly concave, columellar lip dilated; parietal callus moderately heavy, white.

Alt. 25, diam. 12; aperture  $12\frac{1}{2}$  mill. long.

Alt. 22, diam. 10; aperture 10 mill. long.

*Mejillones, Chili*, on arid hills destitute of vegetation (*Phil.*); *Paposo (Paz)*.

*B. mejillonensis* PFR., Malak. Bl., iv, p. 230 (1857); Monogr., iv, p. 489; vii, 170.—*PHILIPPI*, Reise durch die Wüste Atacama, p. 183, pl. 7, f. 10a, b, c.—*HIDALGO*, Viaje al Pacif. Mol., p. 83.—*B. callosus* *PHIL.*, olim.—*B. mexilloensis* *SCHAUF.*, Paetel's Catal., p. 81.

The internal thickening of the lip is heavier than in allied species. The upper portion of the spire is not so attenuated as in *B. affinis*, and there is no such excavation of the base of columella as in that species.

*B. AFFINIS* Broderip. Pl. 48, figs. 8, 9, 10.

Shell narrowly umbilicate, rather solid or thin, lengthened ovate. Opaque white with interrupted, denticulate corneous streaks, or corneous with white streaks and flecks; slightly shining. Surface with growth-wrinkles, more or less transverse wrinkling or malleation, and in places, traces of spiral incised lines. Spire elevated,

*decidedly attenuated above, apex mamillar, smooth. Whorls 7, moderately convex.*

Aperture less than half the length of shell, long ovate; outer lip slightly obtuse, with no perceptible lip-rib within; columella slightly concave, *attenuated at base*; columellar lip dilated above; parietal callus a transparent glaze.

Alt. 27, diam. 12 mill.; alt. of aperture 12, width 7 mill.

Alt. 26, diam. 11 mill.; alt. of aperture 12, width 6 mill.

*"Mexillones," desert of Atacama, Chili (Cuming).*

*Bulinus affinis* BROD., 1832, p. 106.—SOWB., Conch. Illustr., f. 30.—*Bulimus affinis* DESH. in Lam., An. s. Vert. viii, p. 273.—REEVE, Conch. Icon., pl. 23, f. 154.—PFR., Monogr., ii, p. 207; vii, p. 172; Conchyl. Cab., p. 221, pl. 61. f. 7, 8.—HIDALGO, Journ. de Conch., 1870, p. 60.—*B. paposensis* PFR., Malak. Bl., iii, 1856, p. 207; Monogr., iv, p. 480.

*B. affinis* is more slender than *B. mejillonensis*, with the apical whorls and base of columella attenuated, and with an additional whorl. *B. paposensis* Pfr. is considered by Hidalgo a synonym. I consider it as at most a slight variety.

Var.? *paposensis* Pfr. Shell compressed-umbilicate, ovate-conic, thin, closely striate and subdecussated-granulate; diaphanous variegated and submaculated with white and corneous lines. Spire convex-conic, the apex acute; suture subcrenulated. Whorls 6 to  $6\frac{1}{2}$ , somewhat convex, the last about as long as spire, a little attenuated at base. Columella somewhat straightened, slightly receding. Aperture oblique, oval-oblong; peristome simple, the right margin unexpanded, lightly arcuate, columellar margin dilated and spreading above. Alt. 18, diam.  $9\frac{1}{2}$  mill.; aperture 10 mill. long,  $5\frac{1}{2}$  wide (Pfr.).

*Paposo, Atacama desert (Phil.).*

*B. CALLOSUS* Pfeiffer. *Unfigured.*

Shell perforate, ovate-conic, rather solid, opaque, dull whitish, ornamented with irregular pellucid streaks. Spire conic, rather acute. Whorls 7, rather flat, the last a little longer than spire; columella shortly receding. Aperture acuminate-oval; peristome acute, lipped with a thick callus within, which does not extend to the margin. Columellar margin vaultingly reflexed. Alt. 21, diam. 11 mill.; aperture 12 mill. long, 6 wide. (Pfr.).

*Habitat unknown (coll. v. d. Busch).*

*B. callosus* PFR., Zeitschr. f. Malak., 1846, p. 128; Monogr., ii, p. 222.

This may be allied to *B. mejillonensis*, or it may be a *Buliminus*.

B. LITHOICUS Orbigny. Pl. 1, figs. 2, 3; pl. 51, figs. 14, 15, 23.

Shell subperforate, ovate-conic, rather solid, striatulate and very obsoletely decussated, shining, tawny. Spire convex-conic, rather acute. Suture subcrenulated. Whorls 6, a little convex, the last a little longer than the spire, rotund at base; columella subplicate, receding. Aperture little oblique, oblong-oval, fleshy-whitish inside; peristome unexpanded, acute, the columellar margin dilated, reflexed and subappressed. Alt. 31, diam. 15 mill.; aperture 17 mill. long, 8 wide. (Pfr.).

"Los Obrages" near La Paz, Bolivia, at 3300 meters alt. (Orb.).

*Helix lithoica* Orb., Mag. de Zool., 1835, p. 13.—*Bulimus lithoicus* ORB., Voy. dans l'Amer. Mérid., p. 288, pl. 33, f. 10, 11.—PFR., Monogr., ii, p. 167; iii, 408; iv, 467; vi, 109.—*B. culminans* REEVE, Conch. Icon., pl. 17, f. 98.

The types measure 35 mill. alt., 15 diameter. Fig. 23 is Reeve's *culminans*.

*Group of B. striatus.*

B. STRIATUS King. Pl. 47, figs. 74, 75.

Shell perforate, ovate-conic, thin; immature shells keeled or subangular at the periphery. Whitish, more or less tinged with tawny, with numerous oblique chestnut and blackish streaks, and a dark crescent within the umbilicus (which is often surrounded by a white band); periphery often with a light line; apex purple, smooth. Surface sculptured with fine rib-striae (sometimes subobsolete on body-whorl). Spire conic; whorls 6 to  $6\frac{1}{2}$ , but slightly convex.

Aperture oblong, half the length of shell, quite oblique, light brownish, slightly streaked within. Outer lip thin, dark-edged within; columellar lip somewhat concave, dilated above.

Alt.  $18\frac{1}{2}$  diam.  $9\frac{1}{2}$  mill.

Alt. 16, diam. 9 mill.

*Santos* (Cuming); valley of Ollantaitambo (Angrand), Peru.

*Bulimus striatus* KING in Sowb., Conch. Illustr., f. 56 (July, 1833).—*Bulimus striatus* PFR., Symbolæ, ii, p. 51; Monogr., ii, p. 209; Conchyl. Cab., p. 225, pl. 62, f. 5, 6.—REEVE, Conch. Icon., f. 139. Not *Clausilia striata* Spix.—*Buliminus striatellus* BECK, Index Moll., p. 70 (refers to Sowerby's figure).—PFR., Monogr., iv, p. 491; vi, p. 139.

The striped color pattern and the striation are characteristic. The name *striatus* was not preoccupied in either *Bulimus*, *Bulinus* or *Bulimulus*, so the change proposed by Beck was unnecessary.



*B. PIURANUS* Albers. Pl. 50, figs. 56, 57, 58.

Shell perforate, acuminate-ovate, rather thin, *closely costulate-plicate*; dull fulvous, with two encircling brown bands, frequently interrupted, and irregularly scattered spots. Spire conic, the apex corneous, acute, smooth. Whorls 7, suture distinct, the earlier convex, the last a little shorter than the spire, subangulated around the perforation. Columella straight, slightly receding. Aperture oblong-ovate, the peristome simple, acute; right margin arcuate, columellar margin reflexed and free. Alt. 20, diam. 9 mill.; aperture 7 mill. long, 4 wide. (*Albers*).

*Piura*, northwestern Peru.

*Bulimus piuranus* ALB., Malak. Bl., i, 1854, p. 31.—PFR., Monogr., iv, p. 491.—MOUSSON, Malak. Bl., xvi, p. 177.—*Orthalicus pericanus* H. & A. AD., Gen. Rec. Moll., ii, p. 159.

The specimens before me, two of which are figured, while doubtless belonging to this species, differ in coloration from Alber's description. One is opaque white, with numerous small corneous-brown maculæ and unequally spaced oblique chestnut streaks and an ill-defined peripheral light girdle with traces of several others. Another shell has numerous (6 or 7) girdles formed of more or less coalescent corneous-brown flecks, and no oblique streaks.

The spire is somewhat attenuated above, formed of quite closely coiled whorls, the apex rather small, but obtuse and smooth. The later  $2\frac{1}{2}$  or 3 whorls have regular, close rib-striæ. Specimens measure: Alt.  $19\frac{1}{2}$ , diam.  $9\frac{3}{4}$ , alt. of aperture  $8\frac{1}{2}$ , width (to outer edge of columella) 6 mill. Alt. 20, diam. 10; alt. of aperture  $8\frac{1}{2}$  mill.

The species is close to *B. striatus* King in texture and sculpture, but the spire is much stouter, especially below, as well as longer.

Mousson records it from Bugua and Amazonas, Colombia, collected by Wallis.

*B. ALAUSIENSIS* Cousin. Pl. 50, fig. 59.

Shell perforated, oval oblong, with slender, conic spire; thin, fragile and subtransparent; surface grooved with quite strong, irregular and noticeably oblique growth-striæ; color dull yellowish-white or clear ashy-gray, visibly marbled, the earlier whorls of a darker shade, which on yellowish individuals is reddish-brown, and on ashy-gray shells is blackish. Whorls 8, moderately convex, slowly and regularly increasing; suture linear, well-defined. Earlier two whorls very small and smooth, forming an acute apex. Last whorl slightly ventricose, with an obsolete median carina.

Aperture yellow-reddish within, oval ; outer lip of peristome thin, fragile and acute, inserted above at the edge of a slight keel ; columellar margin nearly straight, thin and fragile, dilated and nearly closing the umbilicus ; a slight channel at base ; parietal callus moderate. Alt. 25, diam. 9-10 ; length of aperture 10, width 5 mill.

*Mt. Hacu, between Achapallus and the Sula River, Alausi district of the province Chimborazo, Ecuador, 2800 meters alt., under stones and at the roots of cacti (Cousin).*

*Thaumastus alausiensis* COUSIN, Bull. Soc. Zool. France, xii, 1887, p. 228, pl. 4, f. 13.

B. DEPSTUS Reeve. Pl. 47, fig. 85.

Shell perforate, ovate-turritid, rather solid, plicatulate ; tawny, irregularly ornamented with chestnut streaks. Spire conic, rather obtuse. Whorls 7, convex, closely plicate at the sutures ; the last whorl about three-sevenths the total length, somewhat compressed toward the narrow perforation. Columella subvertical, slightly arcuate. Aperture slightly oblique, oblong ; peristome simple, the right margin spreading, columellar margin liver-colored, vaulted and reflexed above. Alt. 19, diam. 10 ; aperture  $8\frac{1}{2}$  mill. long, 5 wide. (*Pfr.*).

*Chachapoyas, Peruvian plateau (Lobb).*

*Bulimus depstus* RVE., P. Z. S., 1849, p. 97 ; Conch. Icon., pl. 73, no. 524, f. 525.—PFR., Monogr., iii, p. 428.

B. RECONDITUS Reeve. Pl. 47, fig. 86.

Shell perforate, ovate-conic, rather solid, nearly smooth ; whitish clouded with gray, and ornamented with short streaks and dotted longitudinal lines of chestnut. Spire elongate-conic, somewhat acute. Whorls 7, a little convex, the last shorter than the spire, a little swollen below the sutures, rotund at base. Columella very lightly arcuate. Aperture oblique, oblong-oval ; peristome simple, unexpanded, the columellar margin shortly reflexed above. Alt. 20, diam.  $9\frac{1}{2}$  ; aperture, length 10, width 5 mill. (*Pfr.*).

*Habitat unknown.*

*Bulimus reconditus* RVE., Conch. Icon., pl. 76, f. 549 (Aug., 1849).—PFR., Monogr., iii, p. 422 ; iv, p. 483 ; vi, p. 129.

The "dark longitudinal dashes and finely dotted lines" are its more prominent feature. Pfeiffer has described a variety from Peru as

having narrow chestnut bands, and brown around the umbilicus. Morelet considers it a form of *B. nigropileatus*, but he had seen neither species.

*B. NIGROPILEATUS* Reeve. Pl. 47, fig. 84.

Shell perforate, oblong-turritid, rather solid, subrugose-striate, white. Spire long-conic, the rather obtuse apex black or corneous. Whorls 7, slightly convex, the last a little shorter than the spire, usually with an interrupted brown band below the middle. Columella slightly arcuate. Aperture a little oblique, oblong-oval, brownish inside; peristome simple, unexpanded, the columellar margin dilated and broadly reflexed above. Alt. 21, diam. 9 mill.; aperture  $9\frac{1}{2}$  mill. long, 5 wide. (*Pfr.*).

*Chachapoyas* (Lobb), and *Chota* (Stolzmann) *Peru*.

*Bulimus nigropileatus* RVE., P. Z. S., 1849, p. 97; Conch. Icon., pl. 73, no. 525, f. 524.—PFR., Monogr., iii, p. 427; vi, 137.—LUBOMIRSKI, P. Z. S., 1879, p. 723.

*B. STENACME* Pfeiffer. Pl. 49, figs. 32, 33.

Shell umbilicate, ovate-turritid, rather solid, rugulose striate; whitish, generally variegated with narrow, pale corneous streaks. Spire long, attenuated toward the somewhat acute apex. Whorls 7-8, slightly convex, the last about equal to two-fifths the alt., somewhat compressed around the narrow umbilicus.

Aperture oblique, oblong-oval, brown-fleshy inside; peristome simple, unexpanded, the columellar margin dilated above, vaulted and reflexed. Alt.  $20\frac{1}{2}$ -28, diam. 9-11 mill.; length of aperture 9-11, width 5-7 mill. (*Pfr.*).

*Patás* (Farris), and *Tarma* (Isern), *Peru*.

*Bulimus stenacme* PFR., P. Z. S., 1856, p. 333; Monogr., iv, p. 492; Novit. Conch., iii, p. 464, pl. 101, f. 12, 13 ("stenaeme" on plate).—HIDALGO, Journ. de Conchyl., 1875, p. 130; Viaje al Pacif. p. 131.

The figures do not well show the character of the spire, attenuated toward the apex.

*B. RADIATUS* Morelet. Pl. 49, figs. 25, 26.

Shell rimate, ovate-turritid, thin, little shining, obsoletely and irregularly costulate-striate; whitish with isolated reddish streaks and a very few blackish dots. Spire elongated, the apex acute,



corneous. Whorls 7, a little convex, at the base the last is rotund, rugose and brownish.

Aperture a little exceeding two-fifths the total alt., slightly oblique, oval, brown inside; peristome simple, thin and unexpanded; columellar margin straightened, dilated and reflexed. Alt. 24-29, diam. 10-10½ mill. (*Morel.*).

*Valley of Jauja and slopes of Cuzco, Peru (Angrand).*

*Bulimus radiatus* MOREL., Sér. Conch., iii, p. 188, pl. 9, f. 2.—PFR., Monogr., vi, p. 136.

We come now to a series of *Bulimus* of which *B. striatus* may be considered, if not the type, at least the earliest known representative. The present form is distinguished at first sight by the tawny lines, always quite distinct though more or less dark, which zebra-stripe its surface. Toward the termination of the last whorl, the irregularly spaced lines become wider, diminish in intensity, and little by little merge into a uniform violaceous tint, the striæ becoming more pronounced, giving the surface a rugose appearance. The spire is longer than in *B. munsteri* Orb., the shell more solid, rougher, and the color of the aperture is different. The habits also are diverse, *B. munsteri* living under stones or moss, while *B. radiatus* lives in the open air, on cacti, etc. *B. nigropileatus* Reeve, an umbilicated shell, has the aperture wider and the last whorl more ventricose. Finally, the absence of an umbilicus and the feebleness of the columellar dilation are the principal characters separating it from *B. stenacme* Pfr. (*Morel.*).

*B. OROPHILUS* Morelet. Pl. 46, figs. 55, 56, 57.

Shell umbilicated, oblong-turritid, rather solid, somewhat shining, irregularly and obsoletely costulate-striate; whitish, marked with a few blackish dots; spire elongated, attenuated toward the corneous and rather acute apex. Whorls 7, a little convex, the last usually streaked with rufous, sometimes banded, compressed around the umbilicus, a little shorter than the spire.

Aperture oblique, oblong-oval, fleshy-fulvous inside; peristome simple, unexpanded, the margins somewhat converging, columellar margin dilated above, and reflexed. Alt. 22, diam. 9 mill. (*Morel.*).

*Temperate vallies of the plateaux of Cuzco, Peru, notably at Talavera, Silque, Incahuasi and Mollepata, on cacti of the genus Cereus (Angrand).*

*Bulimus orophilus* MOREL., Sér. Conch., iii, p. 189, pl. 9, f. 6 (1863).—PFR., Monogr., vi, p. 137.—HIDALGO, Mol. Viaje al Pacif., p. 118; Journ. de Conch., 1870, p. 63.

There are three color-forms; unicolored white, longitudinally striped with reddish, and banded with reddish or violaceous.

Two *Bulimi*, *stenacme* Pfr. and *nigropileatus* Reeve (to which *reconditus* Reeve may be united as a variety), are extremely close allies of *B. orophilus*. Although often banded, like *nigropileatus*, it never has the apex colored like that. It is a more elongated shell, with more acute spire, the aperture narrower, more oblique, the columellar margin a little less dilated. *B. stenacme* differs in coloration, proportions of aperture to spire, and the form of the aperture.

Morelet's comparisons, the substance of which is given above, are based upon the descriptions and figures of *nigropileatus* and *stenacme*, not on comparison of specimens.

*B. BALSANUS* Morelet. Pl. 50, fig. 62.

Shell narrowly umbilicated, oblong-conic, delicate, costulate-striate, shining; whitish-fleshy, sparsely streaked with reddish toward the base, and marked with a few blackish dots. Spire tapering, the apex acute, deep reddish. Whorls 6, a little convex, the last a little shorter than the spire.

Aperture a little oblique, oblong oval, scorched-fulvous inside; peristome unexpanded, thin, the columellar margin dilated above, reflexed. Alt. 19, diam.  $8\frac{1}{2}$  mill. (*Morel.*)

*Balsa de Cocharcas, Mountains of Peru* (Angrand).

*Bulimus balsanus* MOREL., Sér. Conch., iii, p. 192, pl. 9, f. 8.—PFR., Monogr., vi, p. 138.

Smaller than *B. orophilus*, less elongated, and with a shining surface. The surface is engraved with oblique, visibly sinuous, spaced and shallow striæ, producing a more or less regular costulation, which disappears on the latter moiety of the last whorl, where it is ornamented with very few, inconspicuous longitudinal reddish lines, as in the majority of the species of this group. Not one is banded. The apex is corneous, glossy, bright red, sometimes brownish. The umbilicus is a little narrower than in *B. orophilus*. It is dotted like *B. orophilus*.

*B. CEREICOLA* Morelet. Pl. 46, fig. 63.

Shell scarcely perforated, oblong-conic, delicate, shining, costulate-striate; whitish, radiated with narrow tawny streaks, and marked

with a very few corneous dots. Spire visibly attenuated, the apex acute, usually violaceous-blackish. Whorls 6, a little convex, the last shorter than the spire, slightly attenuated at base; columella rather straight or receding.

Aperture slightly oblique, reddish-bordered, irregularly oval; the right margin thin, unexpanded, columellar margin dilated above, appressed, nearly closing the perforation. Alt. 20, diam. 9 mill. (*Morel.*).

There is a unicolored white form.

*Peru, in the Vallies of Abancay and Acostambo, west of Cuzco in the interior of the Sierra, on cacti of the genus Cereus (Angrand).*

*Bulimus cercicola* [typog. err.] MOREL., Sér. Conch., iii, p. 192, pl. 9, f. 7; *B. cereicola* MOREL., t. c., p. 193.—PFR., Monogr., vi, p. 138.

This species differs from *B. balsanus* in the absence of an umbilicus, which is reduced to an extremely narrow chink partly by the reflexion of the columellar lip. Moreover, it is larger, with a wider and at the same time less regular aperture, the columella being in some specimens nearly vertical, and the outer lip very markedly curved toward its insertion. The interior of the aperture is not entirely fallow colored, as in the foregoing species, but only colored at the edges, comprising all the visible part of the columella; finally the lines which ornament the exterior are fine and quite regularly spaced.

*B. MUNSTERI* Orbigny. Pl. 51, figs. 9, 10, 11.

Shell narrowly umbilicated, ovate-conic, rather thin, striatulate, subpellucid; corneous-whitish, ornamented with reddish streaks; spire conic, the apex rather acute; suture profound. Whorls 7, convex, the last a little shorter than the spire.

Aperture subvertical, oval; columella somewhat receding; peristome simple, unexpanded, the right margin very much arched above, columellar margin dilated, wide. Alt. 22, diam. 11; aperture 10 mill. long, 5 wide inside. (*Pfr.*).

*Bolivia: Eastern foot-hills of the Cordillera west of Santa Cruz de la Sierra (Orb.); Chungumayu, prov. Yungas, 1440 meters alt. (Stübel).*

*Helix camba* ORB., Voy., pl. 34, f. 4-7 (legend on plate), not *Bulimus camba* ORB., Voy., p. 263.—*Bulimus munsterii* ORB., Voy. dans l'Amér. Merid., p. 278.—PFR., Monogr., ii, p. 109.—*Bulimus cambus*



M. E. GRAY, Figs. Moll. Anim., pl. 73, f. 1.—*Bulimulus (Scutalus) münsteri* Orb., MARTENS, Conchol. Mittheil, i, p. 162.

B. DENDRITIS Morelet. Pl. 50, fig. 63.

Shell covered-perforate, turritid-conic, thin, shining, delicately plicate-striate. Whitish or pale straw-color, marbled irregularly with brownish-purple or chestnut, the spots confusedly arranged in decurrent series, the base with a band of the ground-color circumscribing the umbilical region. Spire tapering, the apex corneous and rather acute. Whorls 7, little convex, the last scarcely half the length of the spire, banded around the perforation.

Aperture oval; peristome simple, thin, the right margin arcuate, columellar margin dilated above, vaultingly reflexed. Alt. 20, diam. 8 mill. (*Morel.*).

Near *Huïro*, Valley of *Santa Ana*, Peru, (Angrand), in axils of maize leaves and on reeds.

*B. dentritis* (typog. err.), MOREL., Sér. Conch., iii, p. 206, pl. 9, f. 5 (1863).—*B. dendritis* MOREL., t. c., p. 207.—PFR., Monogr., vi, p. 137.

The largest specimens are 22 mill. long. It is a thin and fragile species, recalling *Cochlicella acuta* in form, but larger and more prettily colored. The umbilical perforation is narrow and masked by the reflexion of the columellar lip; the aperture is medium sized, and partakes of the external coloring, by transparency. It is sculptured with fine, regular, perceptibly sinuous folds, which show as yellowish lines. There is a buff form of this species, broadly streaked with brown.

The sculpture of the apex is not known, and the delicacy of the shell raises a doubt of the generic position of the species. It may prove to be a *Mesembrinus*.

B. DENDRITOIDES Pilsbry, n. n. Pl. 50, figs. 60, 61.

Shell openly umbilicate, oblong-turritid, thin, substriate, rather shining. Whitish, ornamented with rufous-ferruginous interrupted bands or dots in transverse series. Spire turritid, the apex rather acute, blackish-corneous. Whorls 8-9, very convex, the last about  $\frac{1}{3}$  the length of shell, attenuated at base.

Aperture little oblique, oblong, fleshy-brownish within; peristome simple, slightly expanded, the right margin narrowly arcuate, col-

umellar margin dilated, wide, reflexed. Columella rather straightened. Alt. 18, diam.  $6\frac{1}{2}$  mill.; aperture  $6\frac{1}{2}$  mill. long. (Pfr.).

Between *S. Fernando* and *Patipampa*, Peru, 30 leagues east of *Huancayo*, in "*La Sierra*."

*Bulimus monticola* PHILIPPI, Malak. Bl., xvi, 1869, p. 33.—PFR., *ibid.*, p. 88; Novit. Conch., iii, p. 470, pl. 102, f. 7, 8; Monogr., viii, p. 172. Not *B. monticola* Roth, Mal. Bl., iii, 1856, p. 3.

Very similar to the illustration of *B. dendritis* Morel., but that species is said to be plicate-striate, and with a length of 20 mill. has only 7 whorls. (Phil.).

*B. BILINEATUS* Sowerby. Pl. 50, fig. 64.

Shell narrowly umbilicate, oblong-conic, rather thin; pale brownish, with two darker brown spiral bands bounding a median white band. Surface with indistinct fine growth-lines, and faint traces of minute, close, spiral striæ above. Spire slightly convex conic, the apex smooth, obtuse, brownish. Whorls  $6\frac{1}{2}$ –7, moderately convex.

Aperture slightly over one third the total length, ovate, showing the bands within. Outer lip arcuate, sharp. Columellar lip dilated above.

Alt.  $13\frac{1}{2}$ , diam. 6; alt. of aperture 5 mill. (Specimen).

Alt. 14, diam.  $6\frac{1}{2}$ ; alt. of aperture 6 mill. (Pfr.).

Western U. S. of Colombia, and Island of *St. Elena* (Cuming); *Las Cruces*, Savane, near *Manta*, canton of *Montecristi*, prov. *Manabi*, Ecuador (Cousin).

*Bulinus bilineatus* SOWB., P. Z. S., 1833, p. 37; Conch. Illustr., f. 29.—*Bulimus bilineatus* DESH. in Lam., An. s. Vert., viii, p. 277.—PFR., Conchyl. Cab., p. 231, pl. 62, f. 31–33; Monogr., ii, 211; vi, 132.—*Thaumastus bilineatus* COUSIN, Bull. Soc. Zool. France, xii, 1887, p. 223.

As in *B. striatus*, the young are angular at the periphery. The small size and mouth, smoothish surface, and the coloration, distinguish the species. It extends further northward than any other member of the subgenus.

Group of *B. apodemetes*.

*B. APODEMETES* Orbigny. Pl. 51, figs. 1, 2, 3, 4.

Shell obliquely perforate or closed, ovate, thin, corneous with oblique stripes of chestnut and opaque-white (sometimes lacking the

brown), spire reddish or corneous-brown; sculptured with inconspicuous growth-wrinkles. Spire conic, apex smooth; whorls 6, convex.

Aperture ovate, over half the length of shell, colored within like the outside. Outer lip thin, sharp, regularly arcuate; columellar lip dilated above and reflexed over, *closing or nearly closing the perforation*.

Alt. 28, diam. 18 mill. (*Orb.*).

Alt. 22½, diam. 13½; alt. of aperture 12½ mill. (Specimen).

Alt. 23, diam. 13; alt. of aperture 12½ mill. (Specimen).

*Argentina, provinces of Santa Fe, Entre-Rios, Cordoba, S. Luis Catamarca, Tucuman, Salta, etc.; Bolivia, Santa Cruz de la Sierra (Bridges) and Llanos de Chiquitos (Orb.).*

*Helix apodemetes* ORB., Mag. de Zool., 1835, p. 10.—*Bulinus apodemetes* SOWB., Conch. Illustr., f. 64, 64\*.—*Bulimus apodemetes* ORB., Voy. dans l'Amér. Mérid., p. 279, pl. 30, f. 5-8.—REEVE, Conch. Icon., f. 142 (bad).—PFR., Monogr., ii, p. 173; viii, p. 160.—HIDALGO, Viaje al Pacif., Mol., p. 85.—PARAVICINI, Boll. Mus. Zool. ed Anat. Comp. R. Univ. Torino, ix, no. 181, p. 6 (1894).—*Bulimulus apodemetes* BECK, Index, p. 68.—STROBEL, Mater. Malac. Argentina, p. 26.—DOERING, Bol. Acad. Nac. Ciencias Rep. Argent. (Cordoba), iii, p. 68 (1879).—*Bulimus pessulatus* REEVE, Conch. Icon., pl. 23, f. 153 (June, 1848).—PFR., Monogr., iii, p. 409.—*Plectostylus pessulatus* FFLD., Verh. Zool.-bot. Ges. Wien, xix, p. 875, 1869.

The inflated form, thin, light texture and conspicuous striping render this an easily recognized form. In some places, such as Cordoba de Tucuman, specimens occur without the chestnut stripes. Doering has shown the jaw and teeth to be of the usual type in *Bulimulus*. It is a widely distributed species. I fail to see any differential characters, whatever, in Reeve's *B. pessulatus*, collected by Bridges in Bolivia (fig. 4).

#### B. CENTRALIS Doering.

Shell perforated, ovate-conic, thin, rather smooth, slightly shining; opaque whitish, more or less variegated with very irregular pellucid corneous streaks. Spire oblong-conic, the apex corneous-buff. Whorls 6, a little convex, the last about one-half the total length, not descending. Columella subplicatulate. Aperture oblong-ovate; peristome simple, acute, the right margin reflexed, half clos-



ing the perforation. Length 16-20, diam. 9-10 mill.; aperture 9-10½ mill. long, 5-6 wide. (Doer.).

*Sierra de Cordoba, Argentina.*

*Bulimulus centralis* DOER., Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 69 (1879).

Has much affinity with *B. apodemetes*, with which it lives associated, the form being a miniature of that species; but last whorl longer, its surface smooth. Differs from *B. albus* in the longer contour, and from *B. rouaulti* in not having the last whorl obliquely descending. Jaw with 13-14 slightly curved riblets, those toward the median part much narrower; basal margin serrate. Teeth in nearly straight transverse series.

*B. VENTANENSIS* n. sp. Pl. 1, fig. 8.

Shell narrowly perforate, ovate-conic, thin; closely and obliquely streaked with blackish, brown and pale olive-brown, the earlier whorls lighter; shining. Surface sculptured with rather coarse and unequal growth-wrinkles. Spire short conic, the apex smooth, white, and obtuse at the rather small tip. Whorls 5½, slightly convex.

Aperture oblique, about half the shell's length, whitish and showing the streaks within; peristome thin, unexpanded and acute, the outer lip regularly arcuate; columella straightened, descending toward the left, the columellar margin reflexed and triangularly expanded, flattened, and applied closely over the umbilical area, leaving a narrow chink open.

Alt. 21, diam. 10½; alt. of aperture 11 mill.

Alt. 22, diam. 11; alt. of aperture 10½ mill.

Alt. 19½, diam. 10½; alt. of aperture 10 mill.

*Sierra de la Ventana, prov. Buenos Ayres, Argentina.*

As thin a shell as the allied *B. apodemetes*, but very much more slender and with darker coloring.

*B. CONOSPIRUS* Doering. *Unfigured.*

Shell perforate, ovate-conic, rather solid; whitish, opaque; nearly smooth, densely and irregularly striated. Spire perfectly conical, the apex obtuse. Whorls 5, rather flat, the last more convex, a little longer than the spire; columella obsoletely folded. Aperture subvertical, oval, pale brown within, shining; peristome simple, obtuse, very narrowly subexpanded, columellar lip somewhat dilated,

expanded. Length 21-24, diam. 13-16½; aperture 12-14 mill. long, 8-9 wide. (Doering).

*Sierra of Tucuman, Argentina* (Hieronymus).

*Scutalus conospirus* D., Bol. Acad. Nac. de Cien. Rep. Argent., iii, 1879, p. 67.

Jaw with 12 riblets, those at the ends wider, all somewhat prominent at the lower edge. Teeth of radula in approximately straight series, as in the typical Bulimuli.

Var. *fasciata*. With obsolete and interrupted pale brown, translucent spiral bands.

#### B. OXYLABRIS Doering.

Shell rimate, conic-oblong, subfusiform, irregularly rugose-striate, rather smooth; opaque-whitish; spire oblong-conic, the apex pale corneous, rather obtuse. Whorls 6, moderately convex, the last about four-ninths the total alt. Columella obsoletely plicatulate. Aperture subvertical, oval, slightly yellowish inside, shining; peristome simple, unexpanded, acute; columellar margin reflexed, broad, half closing the perforation. Length 17-20, diam. 9-10; aperture, length 9-10½, width 4½-5 mill. (Doer.).

*First Sierra of Cordoba, particularly in the calcareous regions at la Calera, San Antonio, Maldonado, Alta Gracia, Argentina.*

*Scutalus oxylabris* DOERING, Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 65 (1879).

Jaw with 12-15 riblets. *B. oxylabris* differs from *B. peristomatus* in the smaller size and elongate shape, the unexpanded peristome, more acute and not reflexed.

#### B. STELZNERI Dohrn. Pl. 51, figs. 20, 21, 22.

Shell profoundly rimate, ovate-conic, rather thin, densely and irregularly rugose-striate; dull whitish; apex minute, smooth; spire conic; whorls 5-6, moderately convex, the last longer than the spire, effuse in front; columella deeply and obsoletely folded. Aperture subvertical, oval, whitish within and shining; peristome simple, the right margin slightly expanded, basal margin dilated, narrowly expanded; columellar margin dilated, wide. Length 23-28, diam. 14-20; alt. of aperture 13-18, width 8-11 mill. (Dohrn).

*Argentina, at "Cerro de Chepe" (Stelzner); Sierra de Catamarca (Jacotula) at about 2000 meters alt. (Döring).*

*Bulimulus (Scutalus) stelzneri* DOHRN, Malak. Bl., xxii, p. 202 (1875); again in xxiv, 1877, p. 157.—KOBELT, Jahrb. D. M. Ges., v, 1878, p. 149, pl. 6, f. 7.—PFR., Monogr., viii, p. 58; Novit. Conch. i<sup>v</sup>, p. 164, pl. 137, f. 8-10.—DOERING, Bol. Acad. Nac. Cien. Rep. Argent., iii, 1879, p. 66.

Nearest to *B. proteus* and *derelictus* in form, and showing the same range of variation in size and shape, but differing from both in sculpture, thinness, and formation of the umbilical region. (*Dohrn*).

#### B. MONTICOLA Doering.

Shell perforate, ovate-conic, thin, little shining, pellucid-corneous or reddish-corneous (sometimes ornamented with obscure, brownish longitudinal bands), variegated with close, opaque-whitish, wrinkled, elevated and very irregular striae. Spire conic, apex rather acute. Whorls 6, a little convex, the first buff, smoothish, the last more swollen, over one-half the entire length.

Aperture oblong-ovate; peristome simple, thin, acute; right margin regularly arcuate; columellar margin reflexed, half closing the perforation. Alt. 13-17, diam. 7-9 mill.; aperture 7-9 mill. long, 4-5 wide. (*Doer.*).

*Sierra de los Granadillos, prov. Catamarca, and on the slopes of Tocina, Sierra de Famatina, at 3300-4000 meters alt.; darker form from la Quebrada de S. Isidro, prov. Mendoza, Argentina (Stelzner).*

*Bulimulus monticola* DOER., Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 69 (not *Bulimus monticola* Phil., Mal. Bl., 1863, p. 33, see p. 187, nor *Bulimus monticola* Roth a *Buliminus*).

Jaw with 8 thick riblets, the median ones much narrower. Teeth in straight transverse series, relatively large and separated, and comparatively few in number.

The species lives only at considerable altitudes.

#### B. CORDILLERÆ Strobil. Pl. 51, figs. 5, 6, 7.

Shell covered-perforate, oblong-turritid, rather thin; spire turritid, the apex rather obtuse, suture impressed. Whorls 6, moderately convex, the first smooth, shining, violaceous, brown or tawny, the rest sculptured with delicate growth-striae, somewhat shining, whitish with longitudinal corneous rays; last whorl not descending, more than a third the shell's length.

Aperture slightly oblique, oval; peristome simple, acute, the margins remote, outer margin unexpanded, columellar reflexed, almost



wholly closing the perforation; parietal wall glossy; throat unicolorous brown or marked like the outside. Alt. 14-15, diam. 6-7; aperture, length 6-7, width 4-5 mill. (*Strob.*).

*Villa Vicencio and Casa de Piedra, Sierra de Mendoza, Argentina.*

*Bulimulus (Mesembrinus) cordillerae* STROB., Mater. Malac. Argent., p. 22, pl. 1, f. 3 (1874).—*B. cordillerae* DOERING, Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 72.—PFR., Monogr., viii, p. 156.

This species is compared by Strobel with *B. devians* Dohrn, which has fewer whorls and different coloration. Doering believes it allied to his *B. monticola*.

*B. TORTORANUS* Doering.

Shell covered-rimate, conic-oblong, subfusiform, thin, striatulate, subdiaphanous, a little shining, rather smooth; brown or buff-corneous, closely ornamented with very irregular longitudinal opaque-whitish marbled streaks. Whorls 7, rather flat, the first corneous or corneous-buff, the rest variegated, last whorl oblong-ventricose, about four-ninths the total length. Columella plicatulate. Aperture oblong-oval; peristome simple, thin, acute, the basal margin a little expanded, the columellar margin shortly reflexed. Alt. 26-27, diam. 10 mill.; aperture 12 mill. long, 6-6½ wide. (*Doer.*).

*Sierra de Pocho (Totoras, Yatan, Cerro Salado, etc.), Argentina.*

*Bulimulus tortoranus* DOER., Bol. Acad. Nac. Cien. Rep. Argent., iii, p. 71.

Has some affinity with *B. cordillerae*, but is more conic, not so pupiform, the whorls are less convex, and the aperture is more prolonged and a little reflexed at the base. Jaw of 10-12 large riblets, the median ones narrower.

*B. FAYSSIANUS* Petit. Pl. 51, fig. 8.

Shell ovate-oblong, brown, a little paler toward the sutures, shining, somewhat translucid, longitudinally very delicately striated. Whorls 7, somewhat convex. Spire conic, slightly longer than the aperture. Aperture pale purple-brown inside; columella oblique above, straight below, white and dilated over the umbilicus which it in large part covers; right margin very thin, acute. Alt. 31, diam. 16 mill. (*Petit*).

*Argentina.*

*Bulimus fayssianus* PETIT DE LA SAUSSAYE, Journ. de Conch., 1853, p. 250, pl. 8, f. 7.—PFR., Monogr., iv, p. 500.

Remarkable for its regular, symmetrical form, its coloration and transparency.

**B. HELOICUS** Orbigny. Pl. 51, figs. 12, 13.

Shell narrowly umbilicated, oblong-conic, thin, substriatulate, as if frosted, corneous- or whitish-yellow. Spire conic, the apex obtuse. Whorls  $6\frac{1}{2}$ -7, scarcely convex, the last a little shorter than the spire, rotund at base. Columella receding. Aperture little oblique, oval; peristome simple, thin, the columellar margin dilated above, vaultingly reflexed. Alt. 24, diam.  $10\frac{1}{2}$  mill.; aperture  $12\frac{1}{2}$  mill. long. 6 wide. (*Pfr.*).

Alt. 25, diam. 12 mill. (*Orb.*).

*Mission of Bidosi, Prov. Santa Cruz de la Sierra, Bolivia (Orb.).*

*Helix heloica* ORD., Mag. de Zool., 1835, p. 11.—*Bulimus heloicus* ORB., Voy., p. 272, pl. 30, f. 9-11.—PFR., Monogr., ii, p. 204; iii, 439; iv, p. 504; vi, 152.—*Bulimulus heloicus* BECK, Index, p. 67.—*B. heloecus* ALBERS.—*Otostomus heloicus* H. ADAMS, P. Z. S., 1866, p. 442.

It is also recorded from eastern Peru. Subgeneric position uncertain.

**B. TURRITELLATUS** Beck. Pl. 50, figs. 65, 66.

Shell openly perforate, ovate-conic, rather thin, smooth, subdiaphanous; corneous-gray, ornamented with close white lines. Spire conic and rather acute, the apex pale corneous or roseate. Whorls 6, slightly convex, the last slightly shorter than the spire. Columella very slightly arcuate. Aperture oblong-oval, the peristome simple, unexpanded, columellar margin dilated, somewhat vaultingly spreading. Alt. 21, diam. 10 mill.; alt. of aperture 11, width 5 mill. (*Pfr.*).

*Province of Chiquitos, Bolivia, near the ancient Mission of San Juan (Orb.).*

*Helix turritella* ORB., Mag. de Zool., 1835, p. 13. Not *Helix turritella* Fér.—*Bulimus turritella* ORB., Voy., p. 274, pl. 33, f. 12-14.—REEVE, Conch. Icon., pl. 70, fig. 511.—PFR., Monogr., ii, p. 208.—*Bulimulus turritellatus* BECK, Index Moll., p. 67.

Differs from *B. sporadicus* in the smaller size, more pupiform shape, and line ornamentation.



*Species of uncertain position.***B. LURIDUS Pfeiffer.**

Shell umbilicated, conic-ovate, solid, striatulate, lurid-flesh colored. Spire conic, the apex acute, submamillate. Whorls 6, a little convex, the last slightly longer than the spire, rotund at base. Aperture subvertical, oblong-oval; peristome unexpanded, the right margin white-lipped within, columellar margin dilated, spreading. Alt. 22, diam. 11; aperture length  $11\frac{1}{2}$ , width 7 mill. (*Pfr.*).

*Habitat uncertain.*

*Bulimus luridus* PFR., P. Z. S., 1862, p. 274; Monogr., vi, p. 145. Compare Crosse, Journal de Conchyl., 1871, p. 183, and 1894, p. 172 (1895).

Said by Pfeiffer, on the authority of the label in Cuming's collection, to be from New Caledonia; but according to Crosse it does not seem to exist in that island. The species has not been figured, and may prove to belong to this South American group.

## APPENDIX.

## Genus STROPHOCHEILUS Spix (page 1).

**S. PUDICUS** Müller (p. 6). Reported from Rödersburg by Hensel (Martens, Malak. Bl., xv, p. 178).

**S. PLANIDENS** Mich. (p. 7).

Found by Paz at Corcobado, near Rio Janeiro (Journ. de Conch. 1870, p. 46).

**S. UNIDENTATUS** Sowerby (p. 9). Collected at *Theresopolis, Prov. Sta. Catharina, Brazil*, by H. Fruhsdorfer (Bttg., Nachrbl., 1889, p. 30).

## Subgenus BORUS Albers (p. 10).

Add the synonym: *Megalobulimus* MILLER, Malak. Bl., xxv, p. 172, type *B. garcia-moreni* (= *popelairianus* var. *thammianus*).

The jaw in this species is smooth, as I have found it to be also in *Borus lutescens* var. *australis*. Lubomirski reports *popelairianus* from *Palmal (Stoltzman)* and *Monterico (Jelski)* Peru (P. Z. S., 1879, p. 720).



A somewhat lengthy discussion of the character of the egg-shells of *Borus* will be found in Malak. Blätter, xxv, p. 176.

S. HUASCARI Tschudi (p. 16).—Add: Pl. 16, fig. 25.

S. GRANULOSUS Rang (p. 20). Another synonym is: *Variety of Helix ovalis*, MAWE, Travels in the Interior of Brazil, 1812, p. 199, third plate, upper 3 figs.

S. OVATUS Müller (p. 24). Add to synonyms: *Helix ovalis* Linn., MAWE, Trav. Inter. Brazil, third plate, lower left fig.—*Lymnæa imperialis* LEA, Obs. Gen. Unio, i, p. 193, pl. 19, f. 73 (young shell).

S. PROCLIVIS von Martens.

Shell subimperforate, ovate-oblong, somewhat unequally striatulate, sparsely and subtly malleolate; rather shining, yellow-brown, the suture whitish, irregularly undulating. Whorls 6, the first smooth, whitish, immersed, second and third whorls very convex, rather coarsely ribbed, above whitish and then brown; following whorls rapidly increasing, the next-to-the-last whorl large, little convex; latter half of the last whorl very obliquely descending, the base rotund.

Aperture little oblique, ovate; peristome thickened, narrowly reflexed, roseate; columellar margin within spirally twisting, whitish, outwardly dilated, appressed and roseate; parietal callus distinct, rose-white.

Alt. 89, greater diam. 42, lesser 35 mill.; aperture 45 mill. long; width including peristome 34, excluding peristome 25 mill.

*Mundo Nova, Prov. Rio Grande do Sul, Brazil.*

*Bulimus proclivis* von MARTENS, Sitzungs-Bericht der Gesellschaft Naturforschender Freunde zu Berlin, 1888, no. 4, p. 64 (April 17).—*Bulimus lacunosus* Orb., MARTENS, Malak. Bl., xv, 1868, p. 177 ("Urwalde bei Rödersberg").—*B. Iheringi* CLESSIN, Malak. Bl. (n. F.), p. 167.

The snail collected by Dr. Hensel, and compared with *Bul. lacunosus* in the Malakozoologische Blätter, 1868, p. 177, is this same species in less well preserved condition. It belongs, according to the sculpture of the earlier whorls, in the immediate group of *Bul. ovatus*, and holds a relation to that species similar to that sustained by *B. accelerans* Marts. toward *B. valenciennesi*. (Martens).

No figure has been published. Dr. von Martens' description is translated above. During the same year (1888), Clessin published a description of this species under the name *B. Iheringi*. As it is on one of the last pages of the *Malak. Blätter* for the year, while von Martens' description appeared in the part of the *Sitzungs-Bericht* for April, the latter apparently has priority. Clessin's description here follows:

*B. iheringi* Clessin. Shell lengthened globose, irregularly striated, of a brown color. The sculpture of the second and part of the third whorl is regularly, strongly ribbed, while the apex itself is nearly smooth. The ribs on the fourth whorl do not extend as far as the suture below, and become gradually more irregular in the following whorls, remaining more strongly marked at the suture, and then passing into irregular striæ. Whorls 6, little convex, separated by a deep suture, rather rapidly increasing, the last whorl composing nearly a half of the shell. Aperture narrow-ovate; peristome very much thickened and widened, reflexed, rose-red, the ends connected by a strong, broad, closely appressed callus. Columella twisted, much receding toward the left at its entrance to the aperture. Imperforate. Alt. 90, diam. 43, length of aperture 44 mill. (*Cless.*).

*Taguara del Monde Nuovo, Rio Grande do Sul, Brazil* (H. v. Ihering).

Dr. von Martens, who had the kindness to compare the sending with the original examples in the Berlin Museum collected by Dr. Hensel, writes regarding this species: "It is the same species which I identified doubtfully as *B. lacunosus* in *Mal. Bl.*, xv, p. 177, from a specimen of Dr. Hensel's in very poor preservation. The illustration of d'Orbigny corresponds fairly well, only *B. lacunosus* has a white peristome and is more tapering above. It appears to be a new species allied to *B. lacunosus*. The apical sculpture is like that of *B. sanctæ Crucis*" (*Cless.*).

S. OBLONGUS Müller (p. 29).

Add the following references: *B. oblongus* (with varieties *albolabiata*, *alba*, *crassa*, *capillacea*) E. A. SMITH, *Proc. Mal. Soc. Lond.* i, p. 137 (June, 1894); also *t. c.*, pp. 306, 317; and *Ann. Mag. N. H.* (6), viii, p. 251.—DALL, *Nautilus*, viii, p. 35.—GUPPY, *P. Z. S.*, 1892, p. 271.—*Helix ovipara*, *Catalogue of the Portland Museum*, p. 87 (1786).

"In my opinion *B. oblongus* is not indigenous in St. Vincent. The Indians ate this and other large *Bulimi*, and may readily have introduced the species from the mainland, where it is common, and where they often went on their forays" (*H. H. Smith*).

In Grenada "this species is moderately common in gardens and shady places below 1000 ft. Probably an imported species" (*H. H. Smith*).

*Bulimus oblongus* has recently been found by Mr. H. G. Hubbard, of the U. S. Agricultural Department, flourishing in St. Kitts, where it has been introduced from Antigua by a resident conchologist. (*Dall*).

Var. *ALBOLABIATA* E. A. Smith.

This name will replace that of var. *tobagoensis* Pilsbry (p. 30).

Var. *ALBA* Smith.

As large as the type, but pure white; lip rose-pink. *Bolivia* (Orb. and Brit. Mus.).

*S. ROSACEUS* King (p. 33) was taken by the 'Challenger' Expedition at Valparaiso, having the aperture closed with a tough horny epiphragm as thick as the operculum of *Paludina* (*Smith*, P. Z. S., 1884, p. 280).

*S. BRIDGESI* Pfr. (p. 35).

Add the following references: *B. bridgesi* Pfr. REEVE, Conch. Icon., pl. 19, f. 117.—GAY, Historia de Chile, viii, p. 107, pl. 3, f. 4.

*S. LUTESCENS* King (p. 36).

Döring, in Bol. Ac. Cordova, ii, p. 335-337 (1876), describes a variety *cordilleræ* from Sierra de Cordoba. Also *B. dorbignii* from Rio Sauce Chico, Sonthern Argentina (= *B. nucleus* Orb. & Strobel, not Sowb., *B. lutescens* var. *australis* Martens). I have not been able to obtain this publication. See also: Informe Comis. R. Negro, i, Zool., p. 64, pl. 1, f. 4.

*S. LORENTZIANUS* Döring. *Sierras de Tucuman, Salta Jujuy, Argentina*.

Described in the place cited above. Not having that volume of the publication, and being unable to obtain a copy from book dealers or from the Society publishing it, I am unable to give a description.



## Subgenus DRYPTUS Alb.

S. MARMORATUS Dkr. (p. 40).

Reported from the colony of Tovar, Venezuela (*Simon!*) by Jousseaume (Mém. Soc. Zool. Fr., ii, 1889, p. 243).

## Subgenus THAUMASTUS Alb. (p. 43).

Add the synonym : *Orphaicus* SCHAUFUSS, Pætel's Catal., 1869, p. 14.

S. SANGOÆ Tschudi (p. 45). Add the synonym *B. pangoæ* Morel., Sér. Conch., iii, p. 155. The Pangoa is a river rising in the heights of Andamarca, and giving its name to the valley which it waters in the lower part of its course.

S. YANAMENSIS Morel. (p. 54). Pl. 44, figs. 79, 80 (young shells).

In the young shells of 12 mill. long,  $2\frac{1}{2}$  whorls or younger, the last whorl is always ornamented with three continuous bands. With increase these become punctate or broken, and disappear on the last whorl.

S. BREPHOIDES Orb. (p. 57). Reported from Amable Maria, Peru (*Jelski*). See P. Z. S., 1879, p. 722.

S. ISERNI Phil. (p. 57). Also collected at Amable Maria (*Jelski*). The name stands *tserni* in P. Z. S., 1879, p. 722.

S. BITENIATUS Nyst (p. 58). Junin, Peru (*Jelski*). P. Z. S., 1879, p. 722, as *B. bifasciatus*.

S. HARTWEGI Pfr. (p. 52). Cuenca, valley of Quito (*Orton*). See Journ. de Conch., 1871, p. 316.

S. THOMPSONI Pfr. (p. 53). Cuenca, valley of Quito (*Orton*). *L. c.*

S. ALUTACEUS Reeve (p. 59). Valley of the Utcubamba, N.-E. Peru (*Stubel*), Conch. Mittheil., p. 157. Amable Maria, Peru (*Jelski*), P. Z. S., 1879, p. 724.

S. PORPHYREUS Pfr. (p. 60). Chota, Peru (*Jelski*). P. Z. S., 1879, p. 722.

## Genus PLEKOCHEILUS Guilding.

P. AURISSILENI Born. (p. 65). Referred to by SMITH, Proc. Mal. Soc. Lond., i, p. 306.

P. COLORATUS Nyst. (p. 74). In the text I neglected to state that the form of this species found by Schlim at Ocana, and figured by Pfr. in Novit. Conch., p. 29, pl. 8, f. 4, 5, has been called *var.*

SUBPLICATA Pfr., in Nomencl. Hel. Viv., p. 226. It is thus defined: Shell longitudinally subplicate, spire longer, last whorl less ventricose than in the type, hardly three-fifths the length of shell. Coloration similar.

P. SCYTODES Pfr. (p. 84). Add the reference: *Bulimus (Eurytus) sytodes* H. & A. Ad., Gen. Rec. Moll., ii, p. 148.

P. JIMENEZI Hidalgo (p. 86). A specimen found by Cousin at Chiniploya, Rio Cosango.

P. ARISTÆUS Crosse (p. 88). Orton collected the types on the road between Quito and Napo.

P. PIPERITUS Sowb. (p. 89). Upper Amazon (Orton, J. de C., 1871, p. 316). Napo (Cousin, Bull. Soc. Zool. Fr., xii, 1887, p. 208).

P. LACRIMOSUS Heimbürg. Pl. 50, figs. 51, 52.

Shell oblong-ovate, thin, subpellucid. Whorls 5, a little convex, rapidly increasing, densely plicate longitudinally, the folds decreasing in sharpness from the penultimate whorl to the smooth, rather blunt apex. Suture somewhat crenate. Last whorl very large, nearly three times the length of spire. Color reddish-brown irregularly strewn with drop-like spots of dark chestnut somewhat shaded, fading out into whitish. Columella thread-like, white, open and free, forming a weak spiral visible to the apex.

Aperture oblong-ovate, large, two-thirds the total alt. of the shell, shining within, brownish with a violet bloom, the spots of the exterior distinctly showing through, and the external folds indicated by weak striæ; peristome simple, acute. (*Heimb.*)

Alt. 62, diam. 28; alt. of aperture 44 mill.

*Iquitos, on the upper Amazon, Peru.*

*Bulimus lacrimosus* HEIMB., Nachr. D. Malak. Ges., 1884, p. 92; Jahrb. D. Malak. Ges., xiv, 1887, p. 1, pl. 1, f. 1.

Resembles *B. succineoides* in the corkscrew twisted axis, very short spire and wide aperture. The coloring and sculpture is like that of *Plekocheilus floccosus*; and in form *P. pintadinus* Orb. (see p. 93) seems similar.

#### Genus AURIS Spix (p. 95).

The dentition of *A. egregius* is described and figured by Binney in Proc. Acad. Nat. Sci., Phila., 1874, pp. 54, 62, pl. 6, f. 1. Of *A. glabra* and *A. multicolor* on p. 62.

## Genus BULIMULUS Leach.

P. 135, top line, read "The single species is anatomically *unknown*, etc.

Under *Geopyrgus*, second reference-line, add after "Not *Pyrgus* Hübner, 1816," the reference: Verzeichniss bekannter Schmetterlinge, p. 109 (*Hesperidæ*).

B. TURRITUS Brod. (p. 135). Another locality is Mina de Chilete, Valley of the Pacasmayo River, on the rainless western side of the cordillera, in Peru (*Stubel*. See *Conch. Mittheil.*, p. 163).

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*Dates of Issue of Volume X.*

Part 37, pp. 1-48, plates 2-15, August 20, 1895.

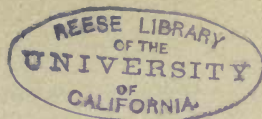
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Part 39, pp. 97-144, plates 31-40, March 13, 1896.

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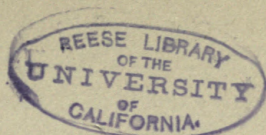
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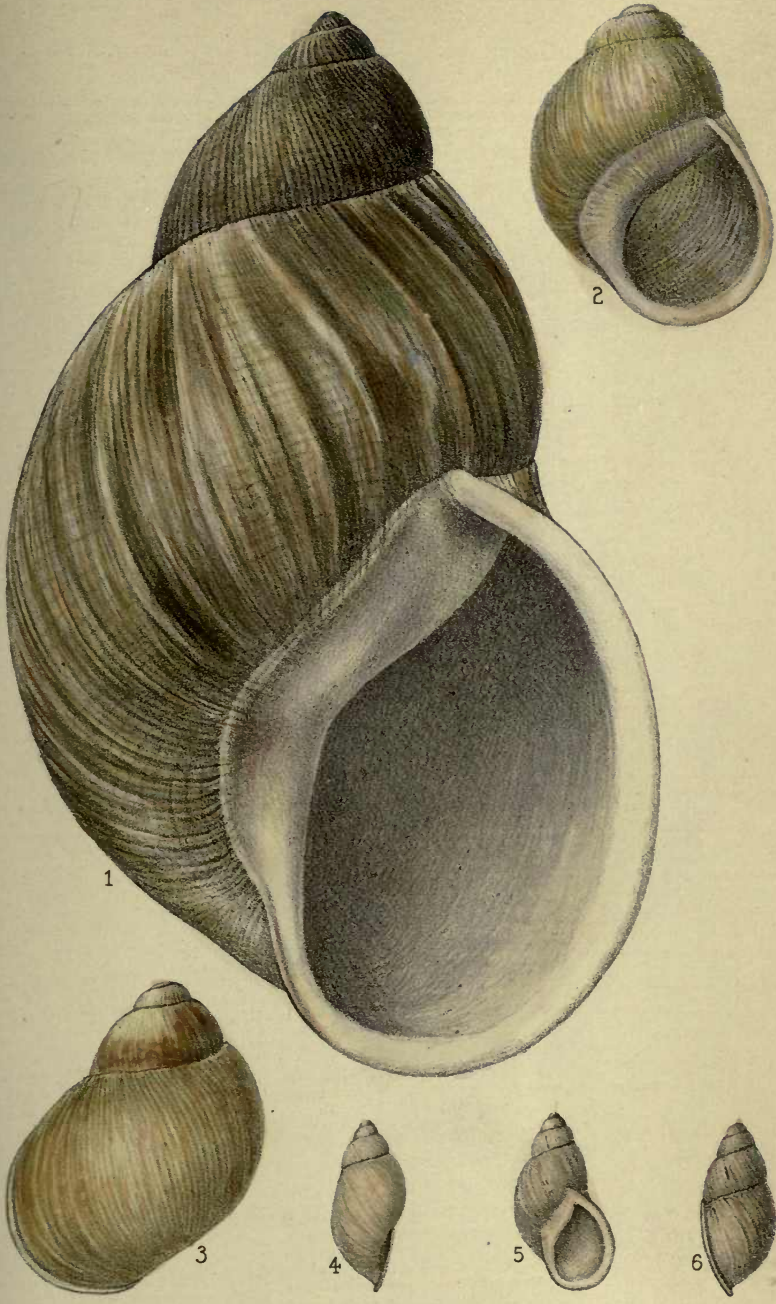




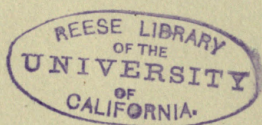








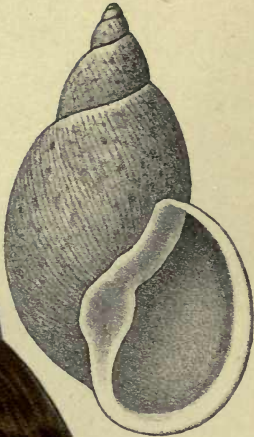








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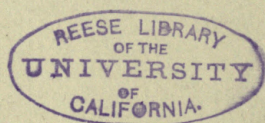
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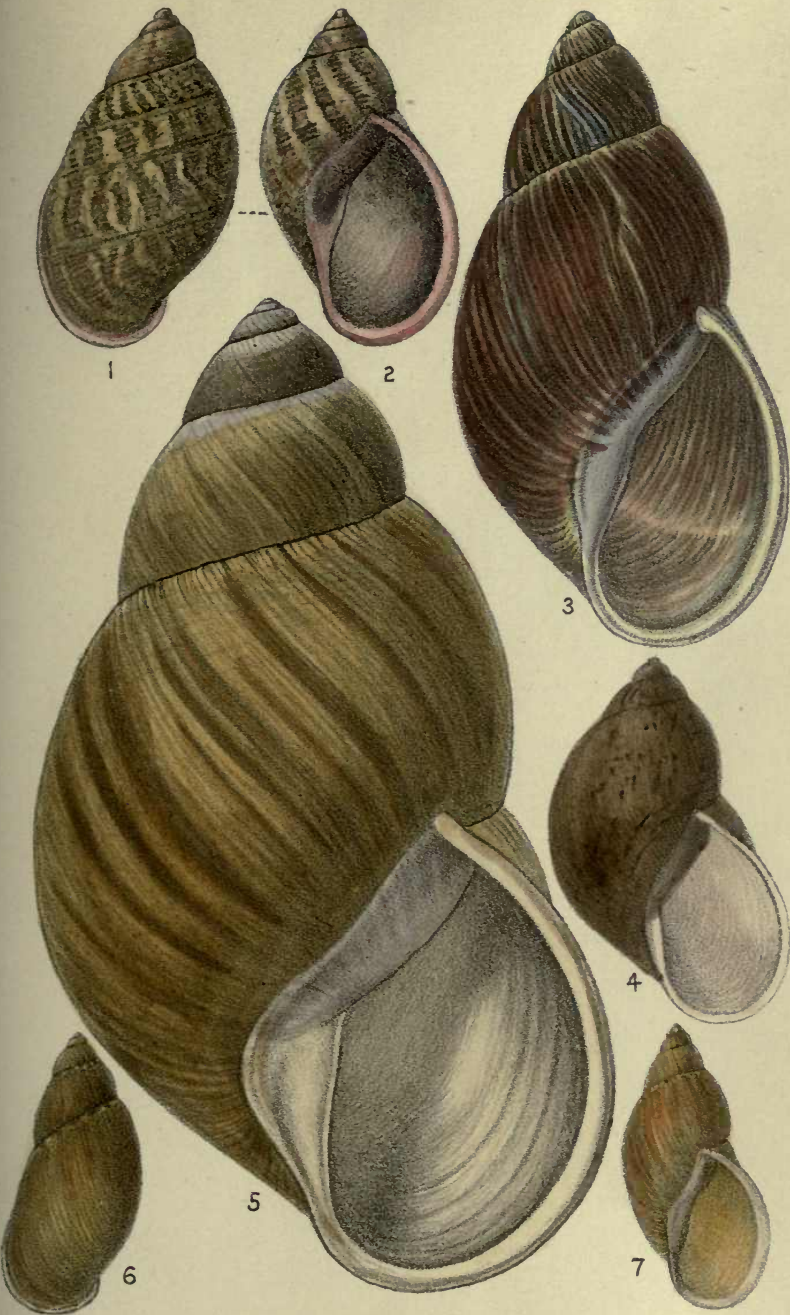
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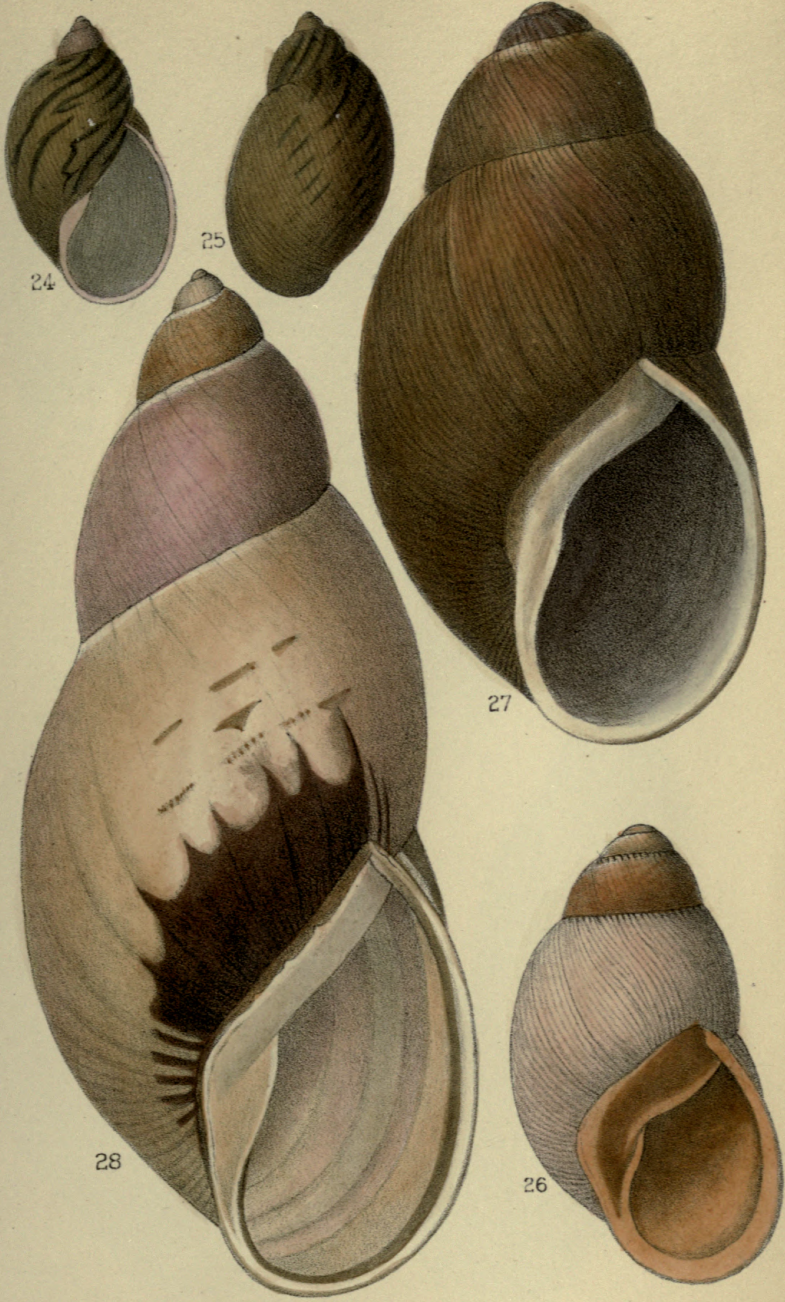








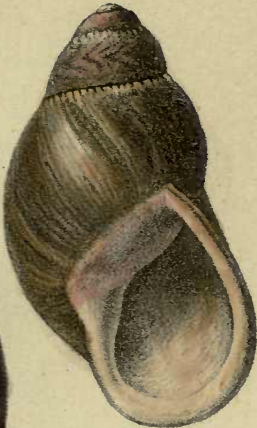
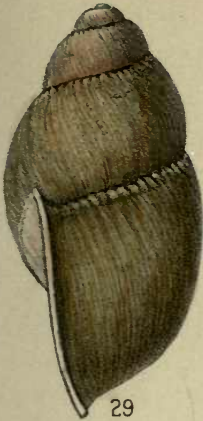


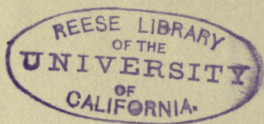




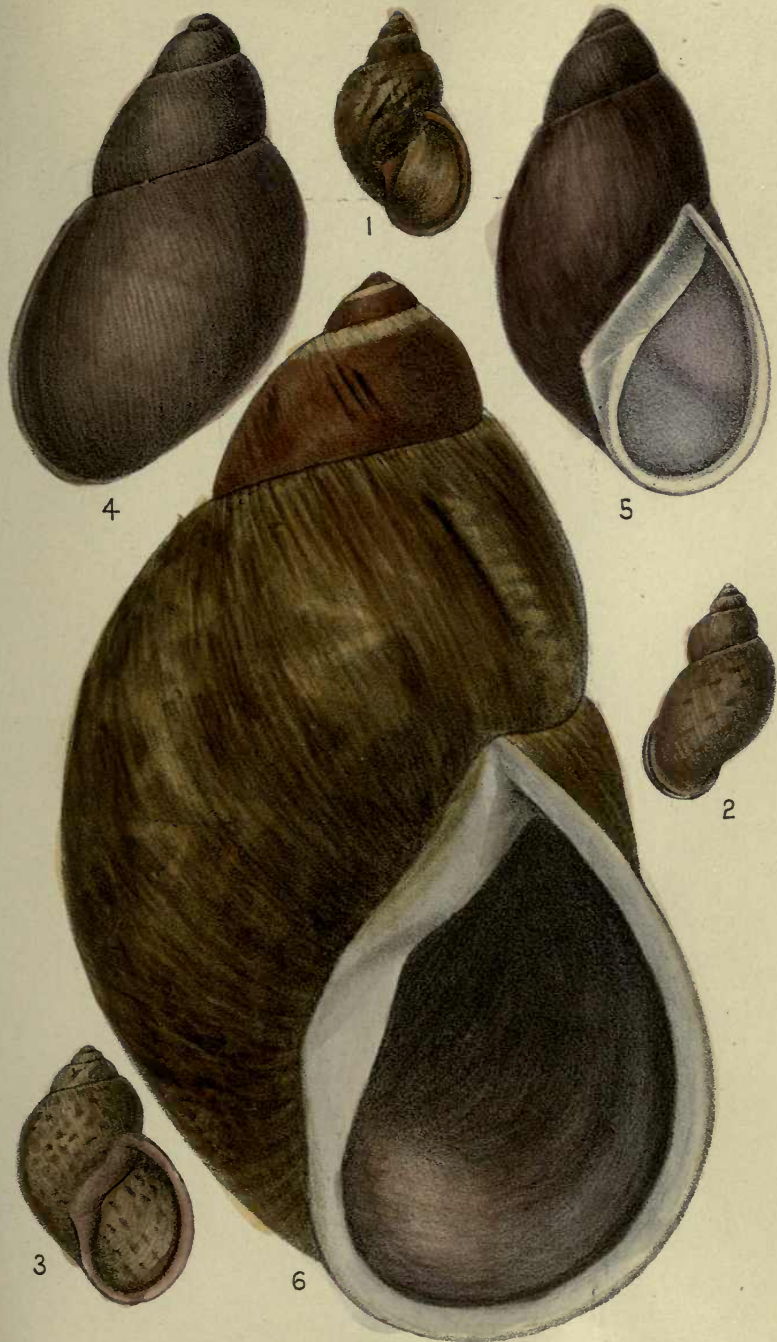




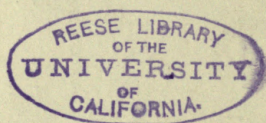




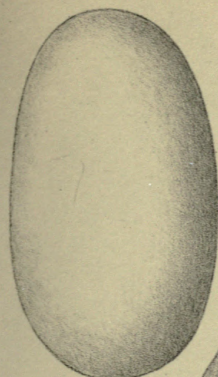












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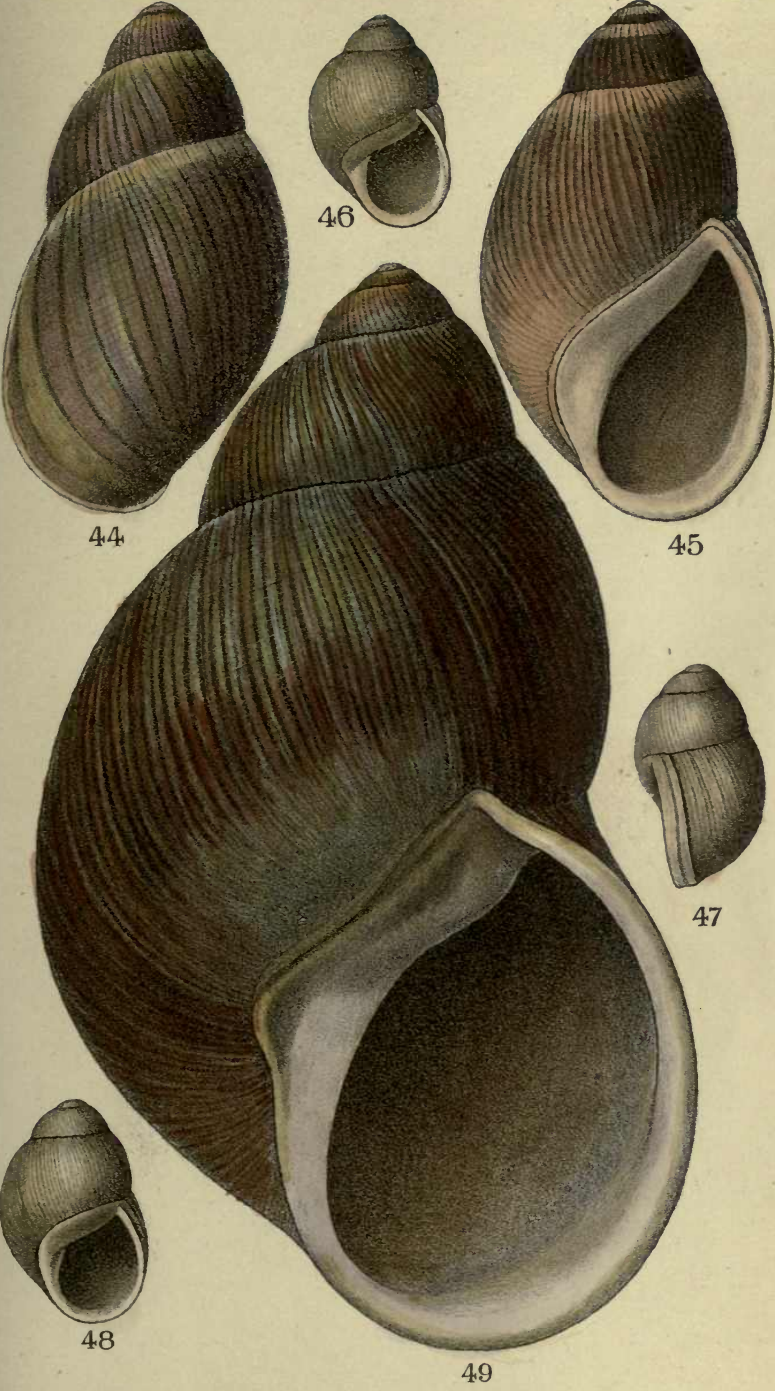


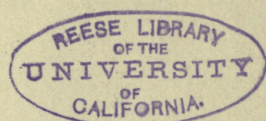
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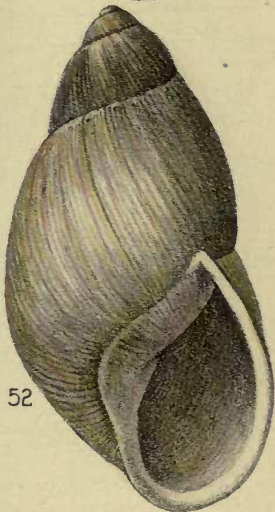
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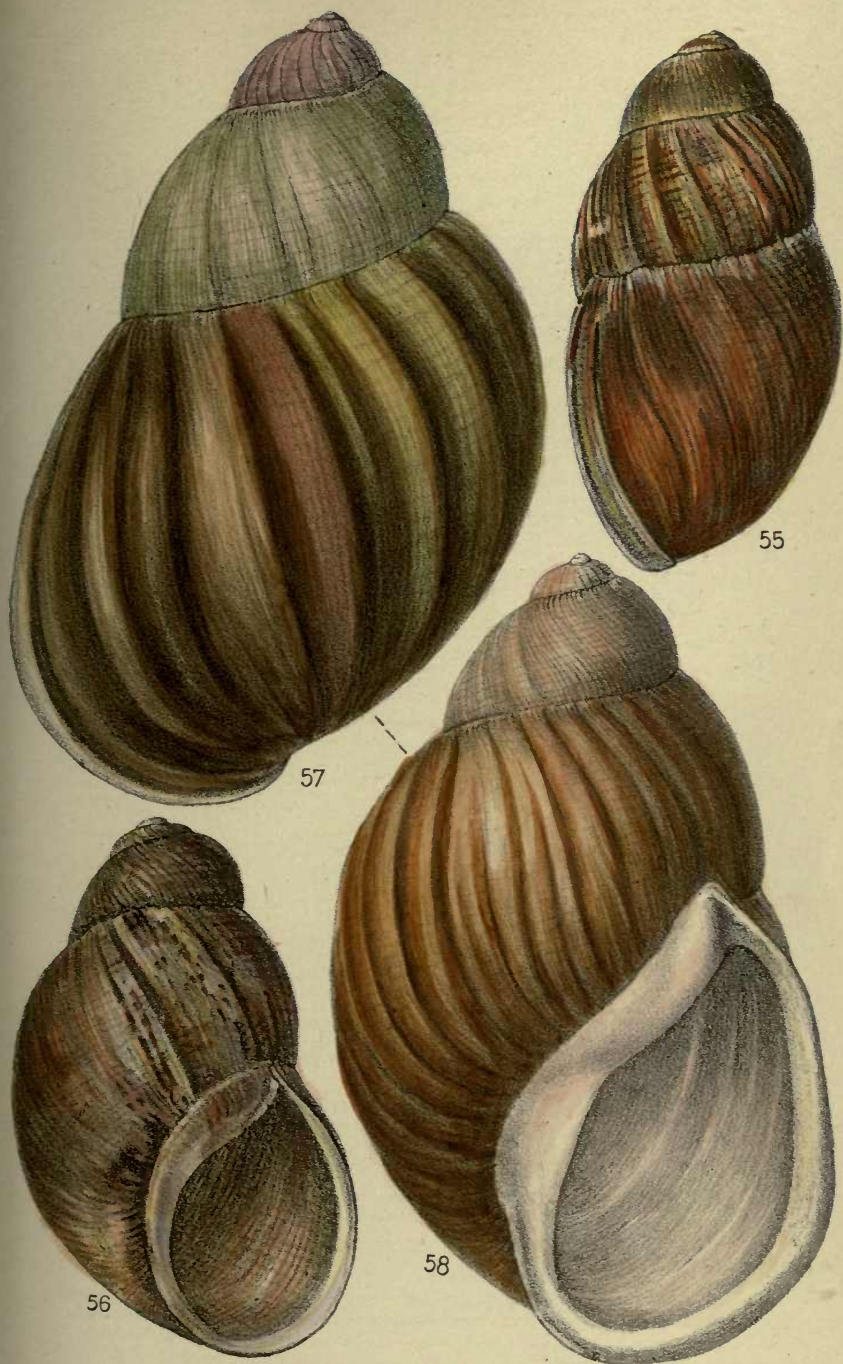
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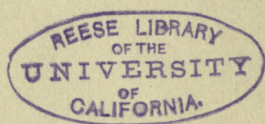


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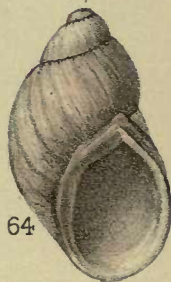


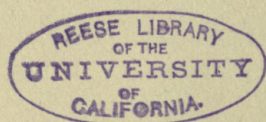
















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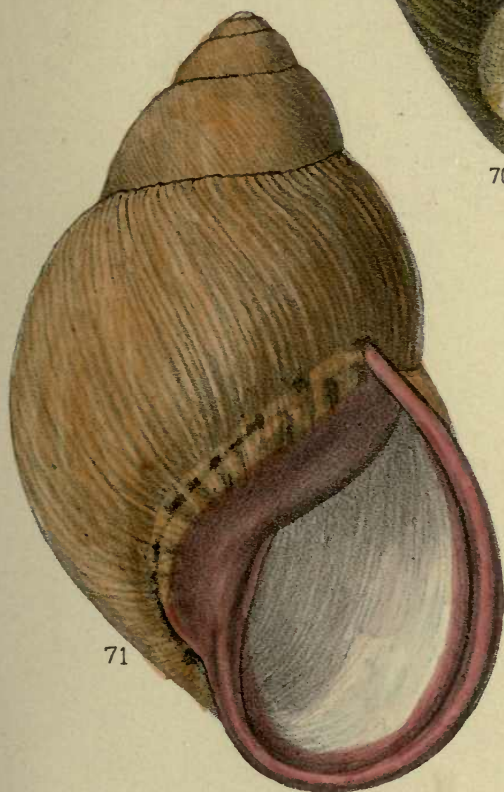
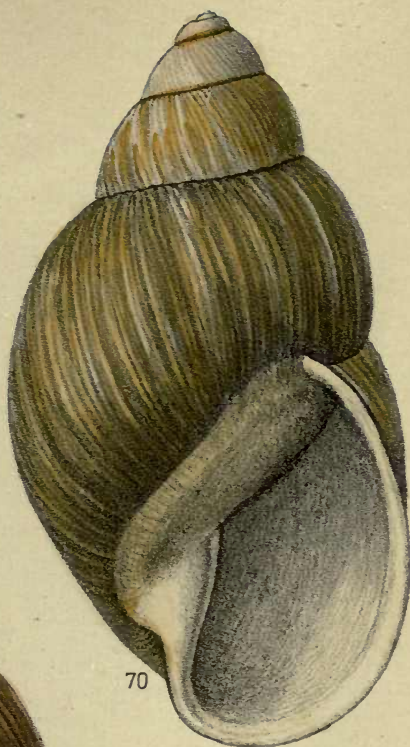
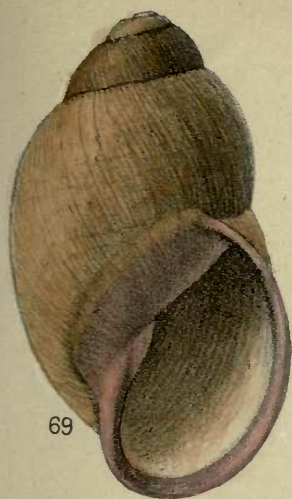
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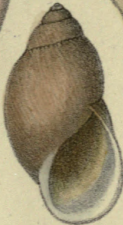








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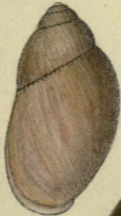
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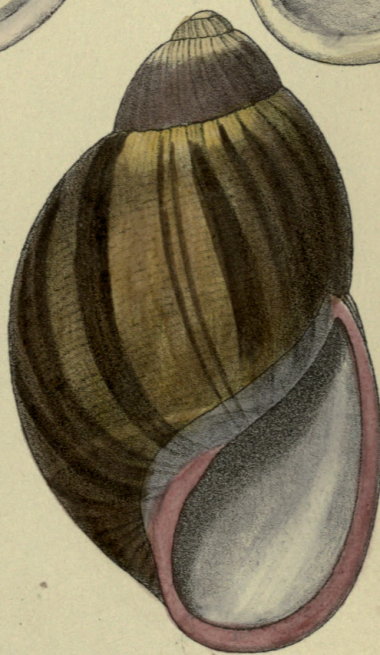
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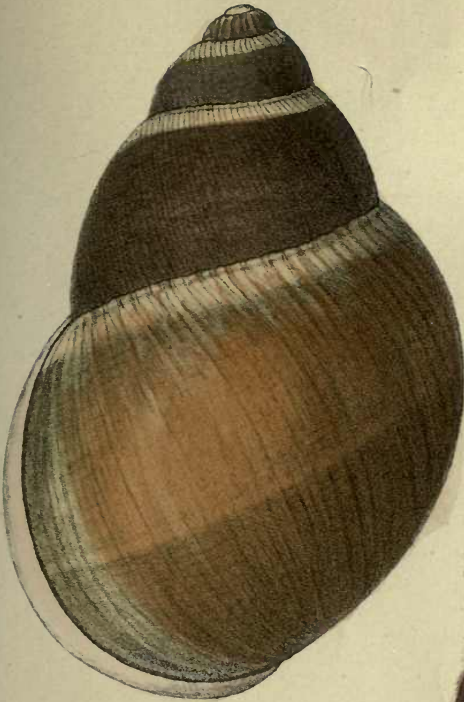


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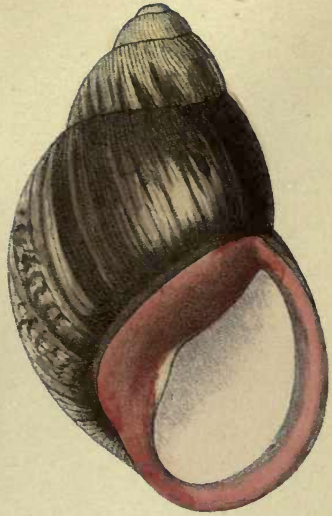




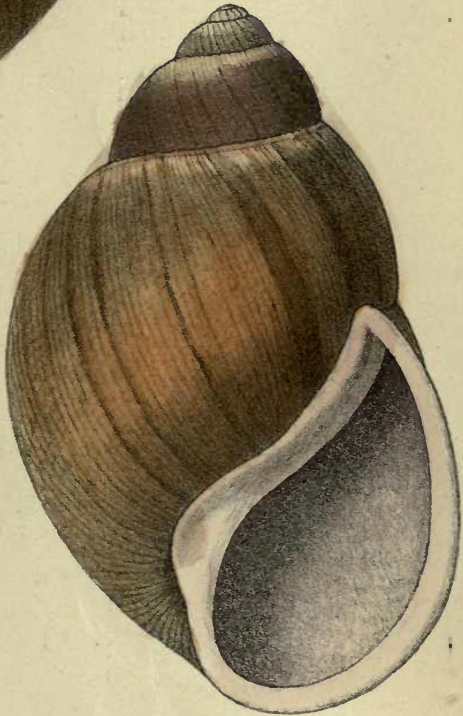




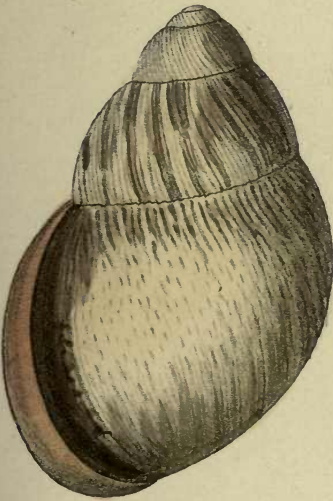
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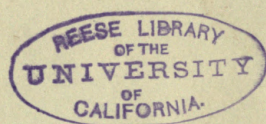
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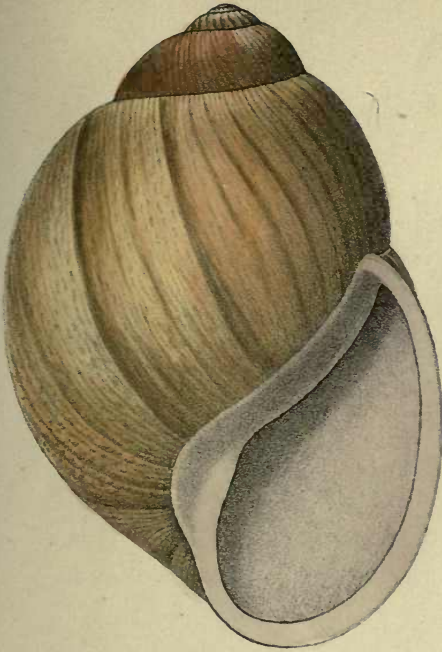
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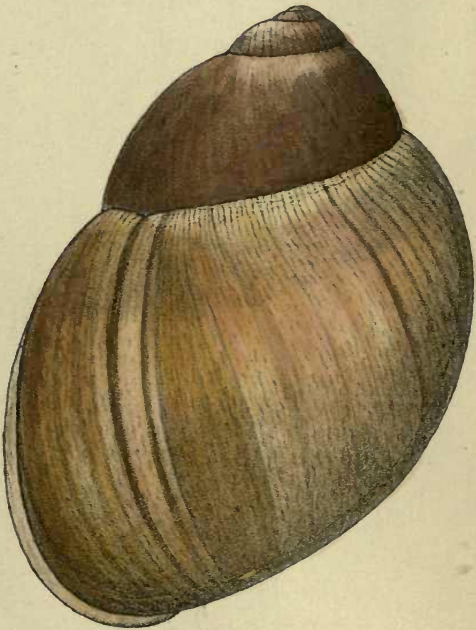
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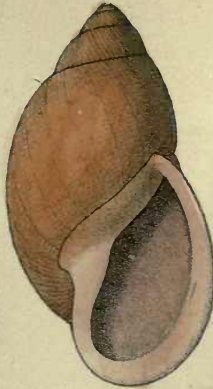
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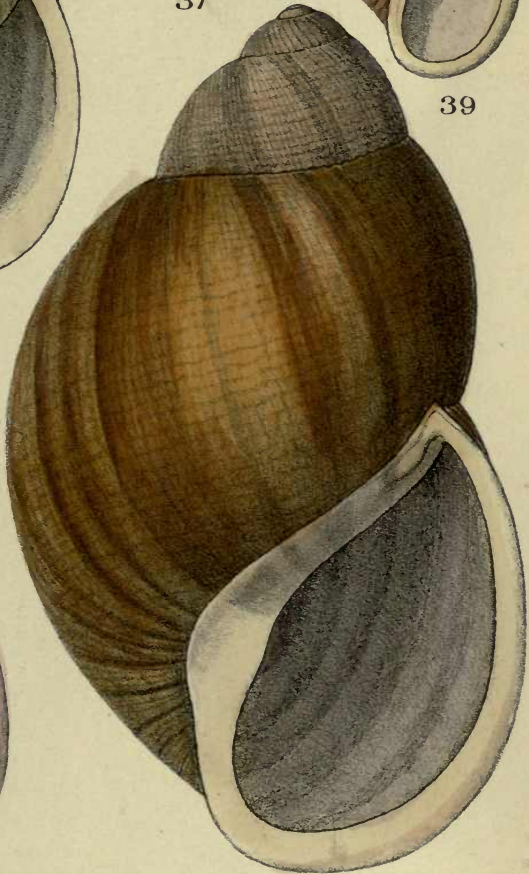
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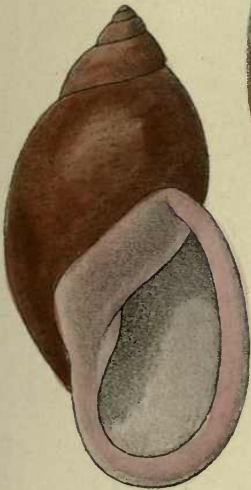
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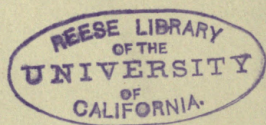
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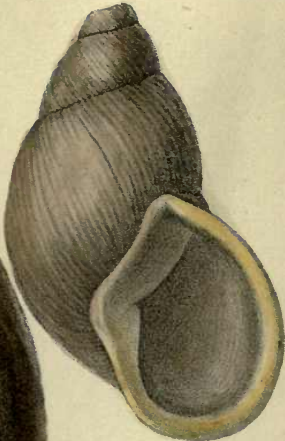
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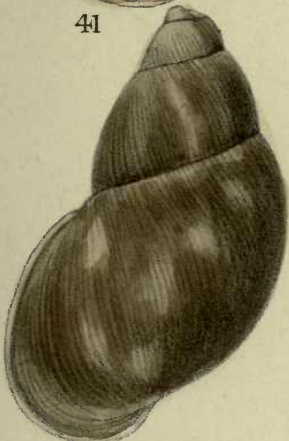


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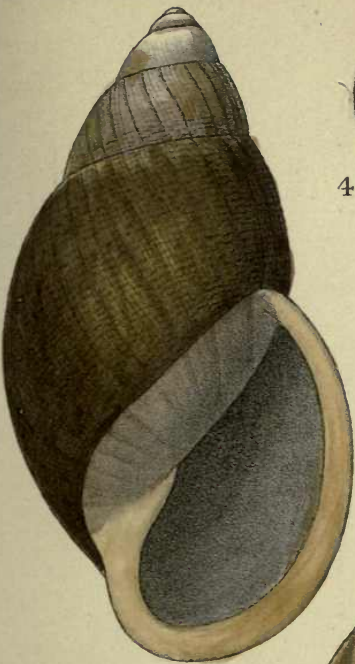
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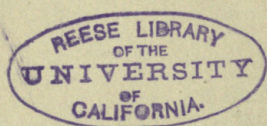
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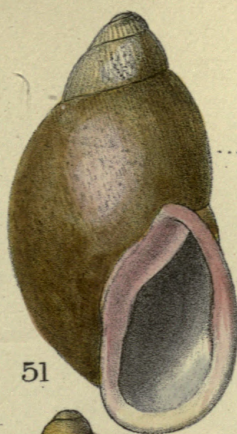
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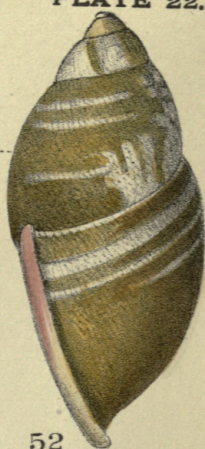




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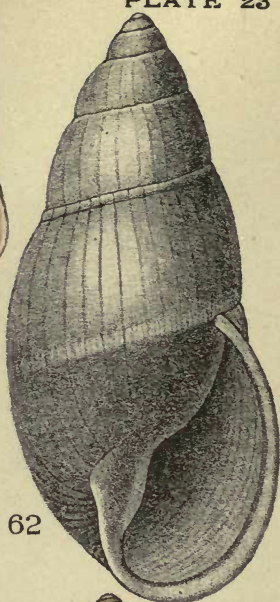




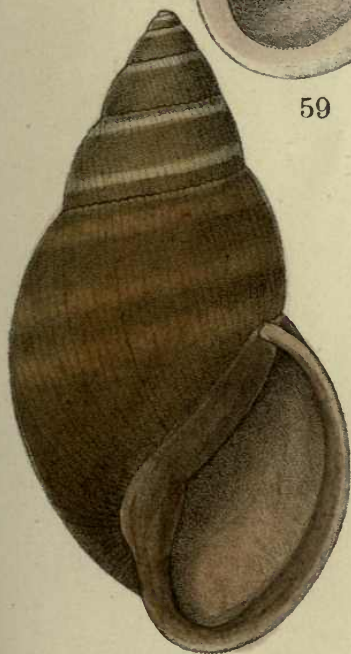
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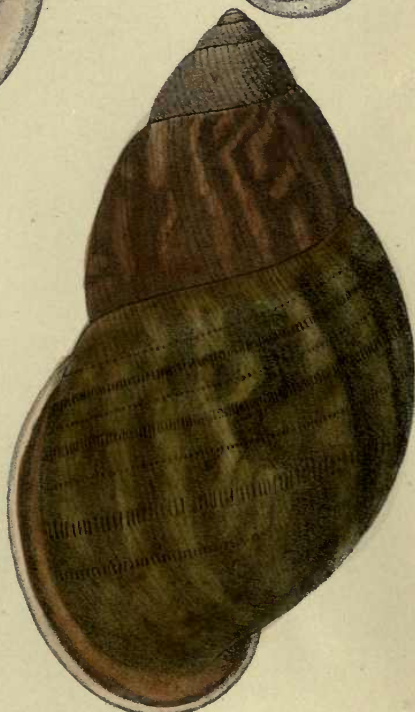
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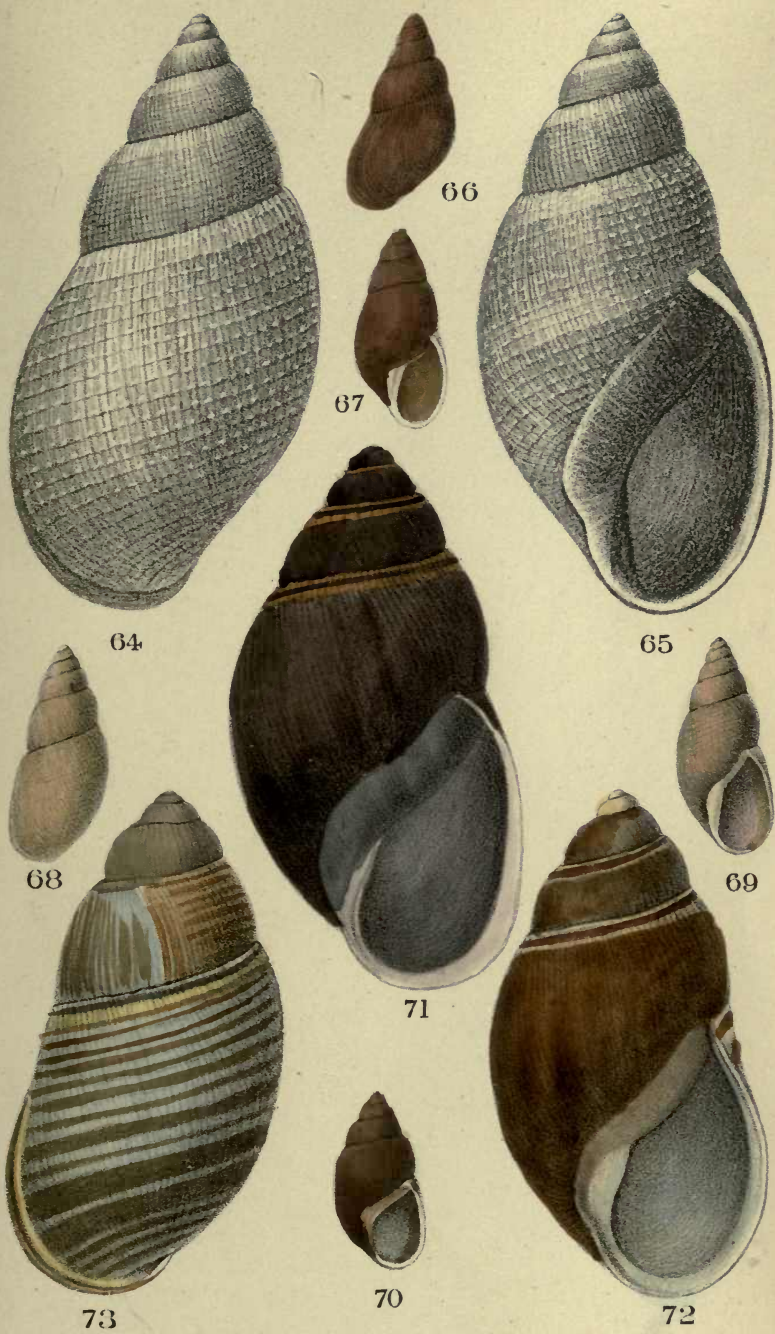
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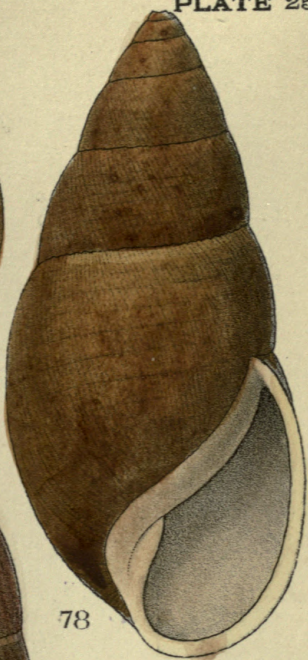




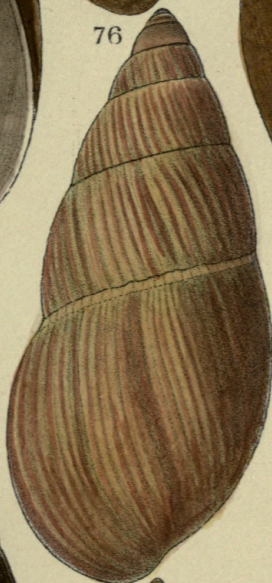
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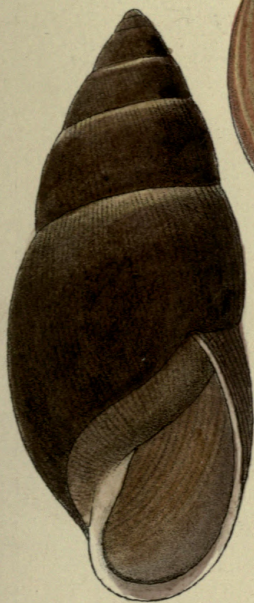
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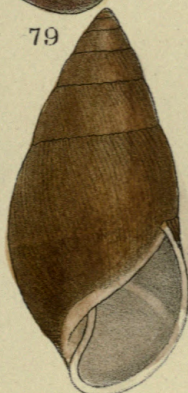
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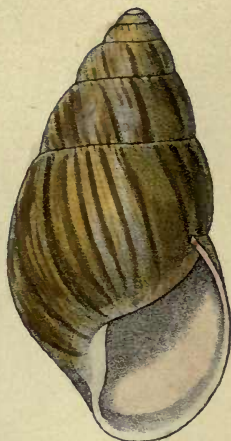




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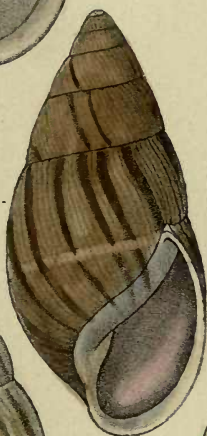
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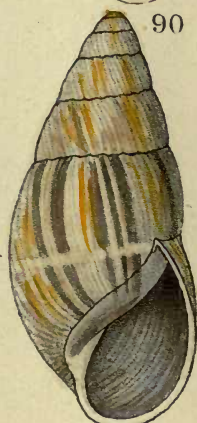
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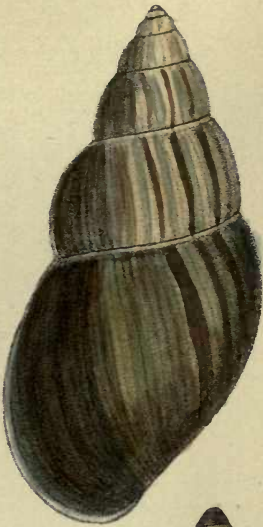
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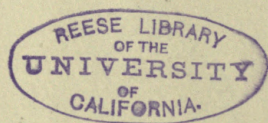
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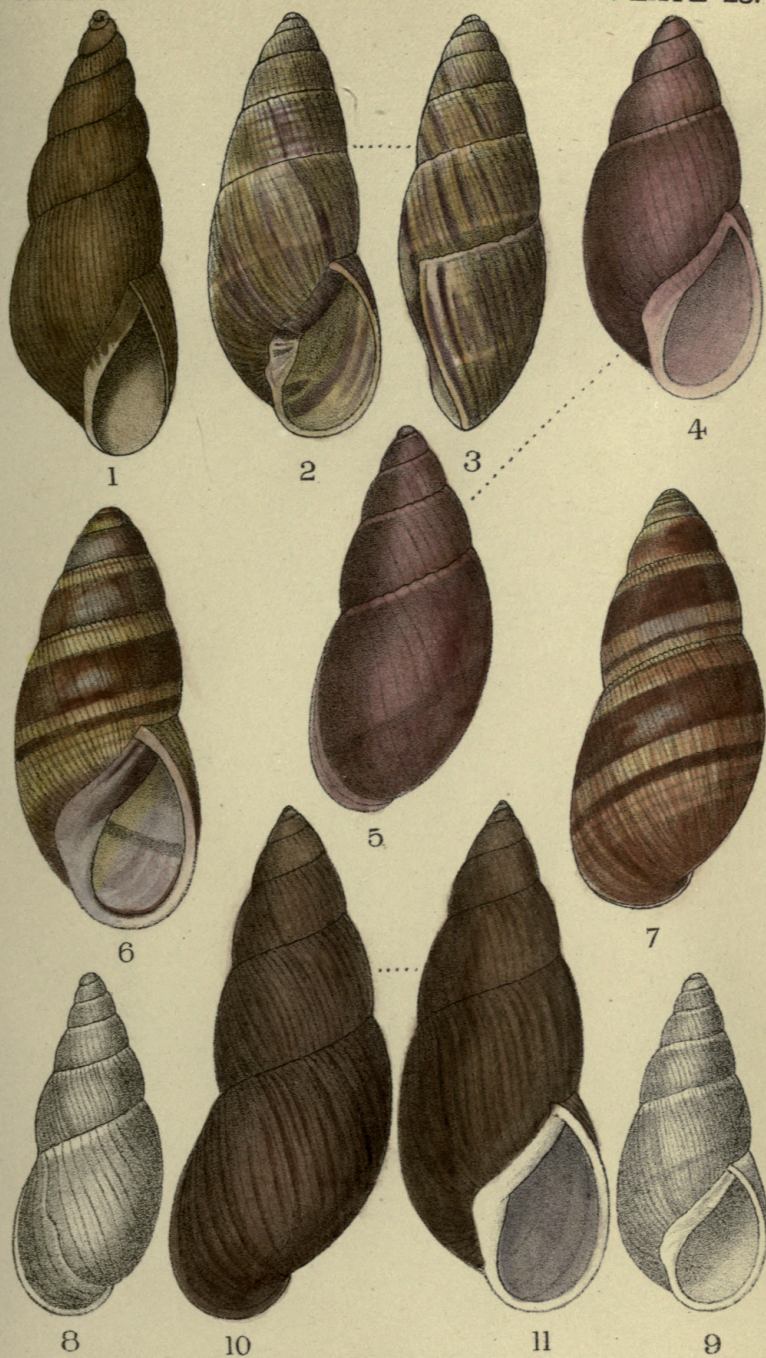
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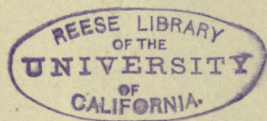
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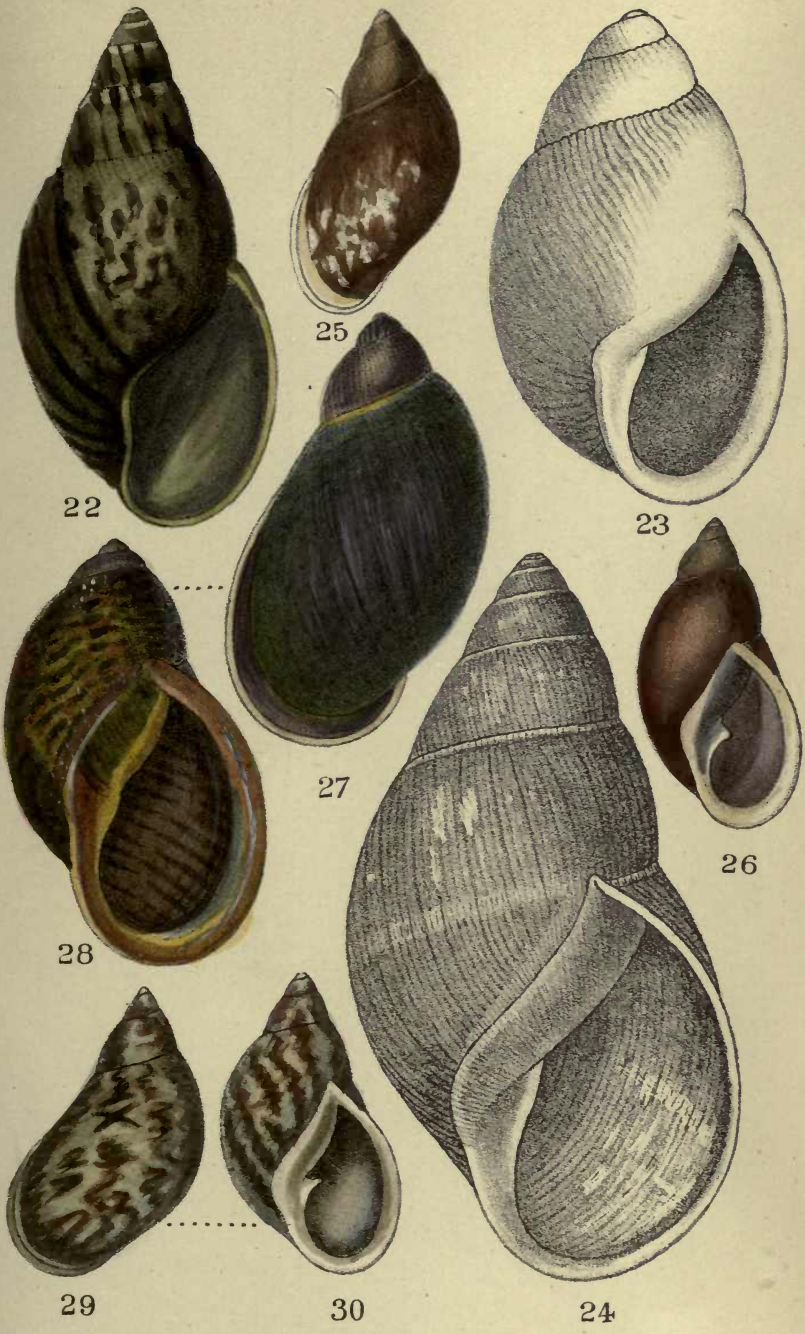






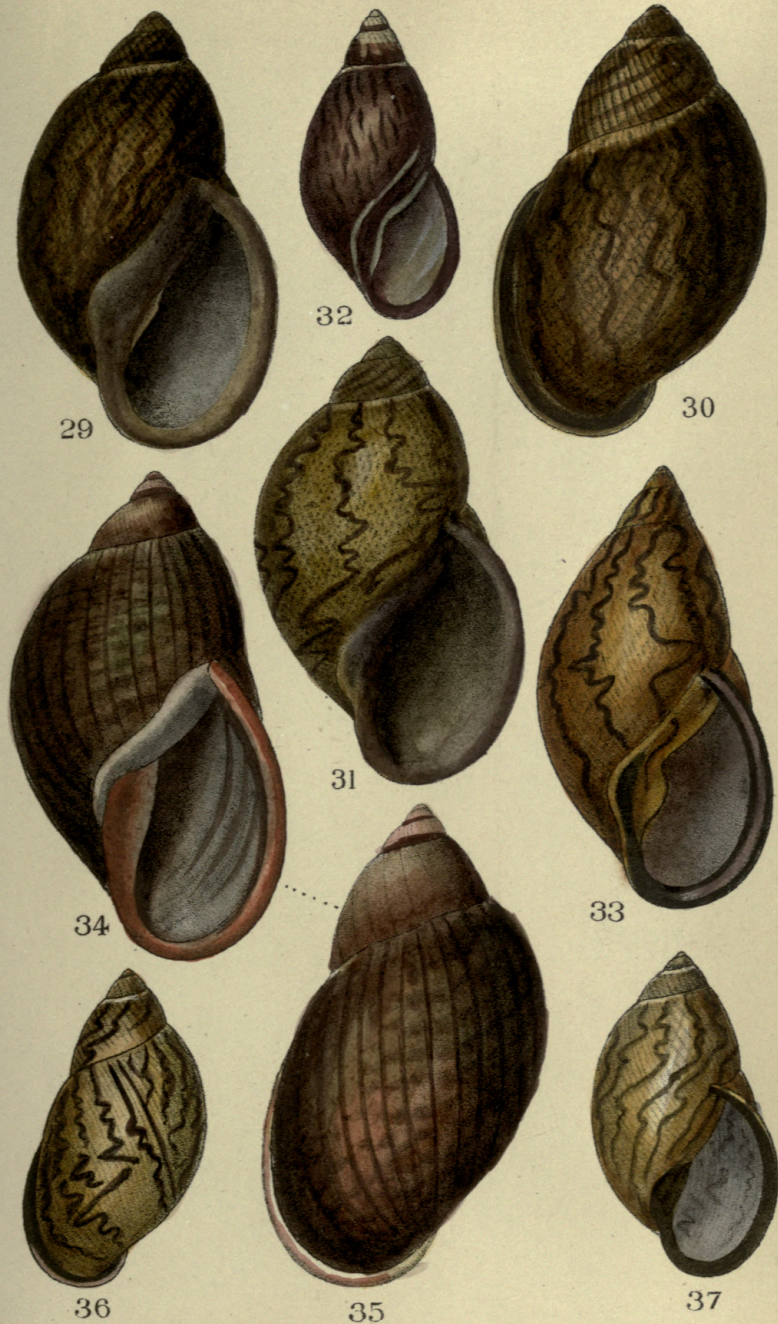
















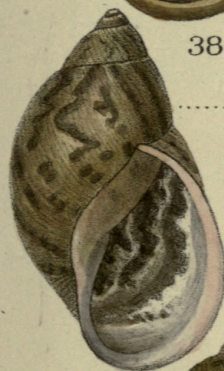




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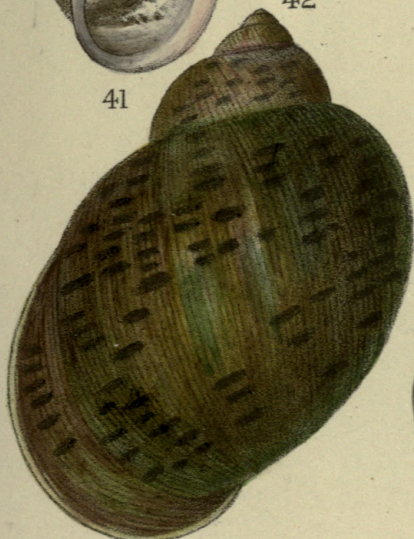


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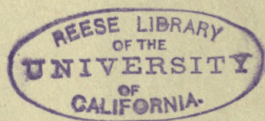


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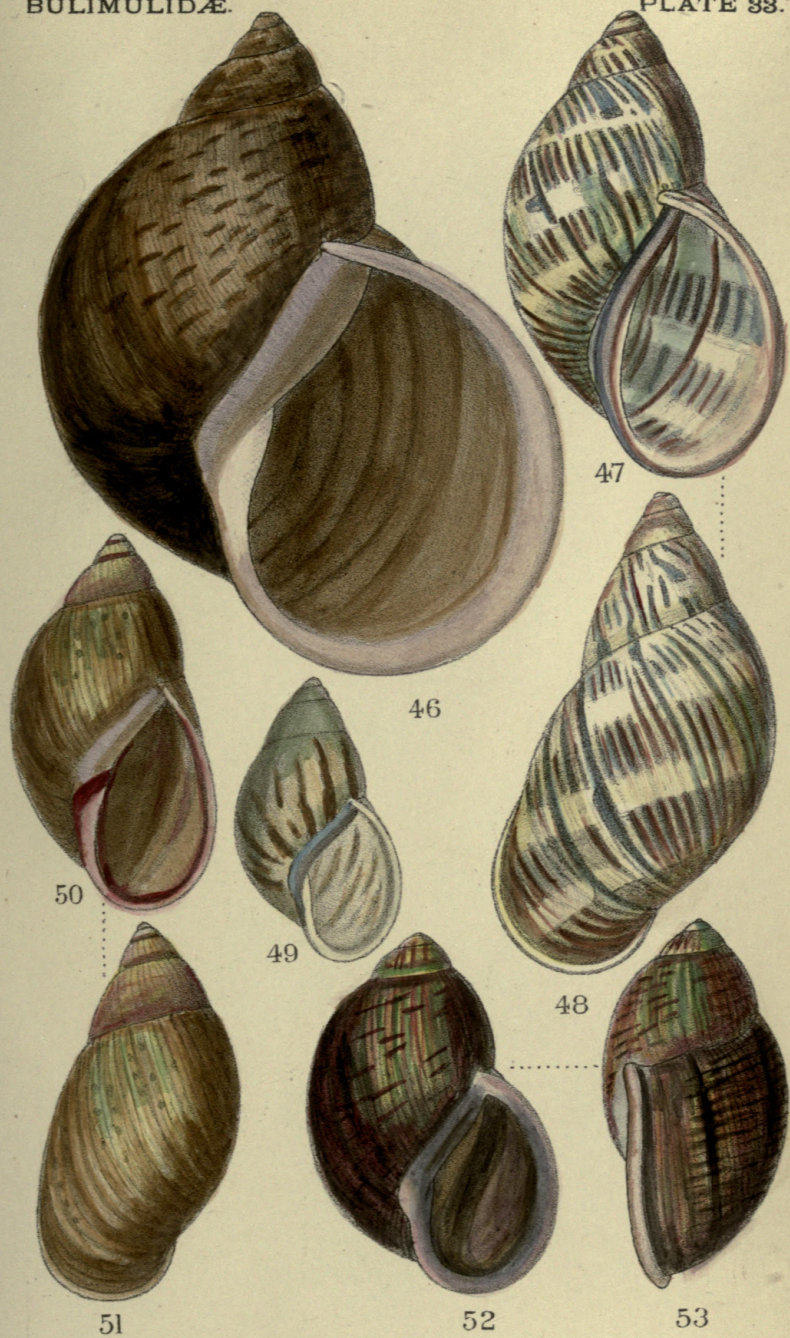


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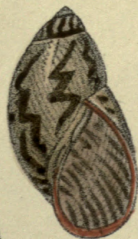




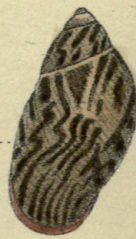
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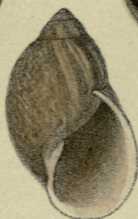
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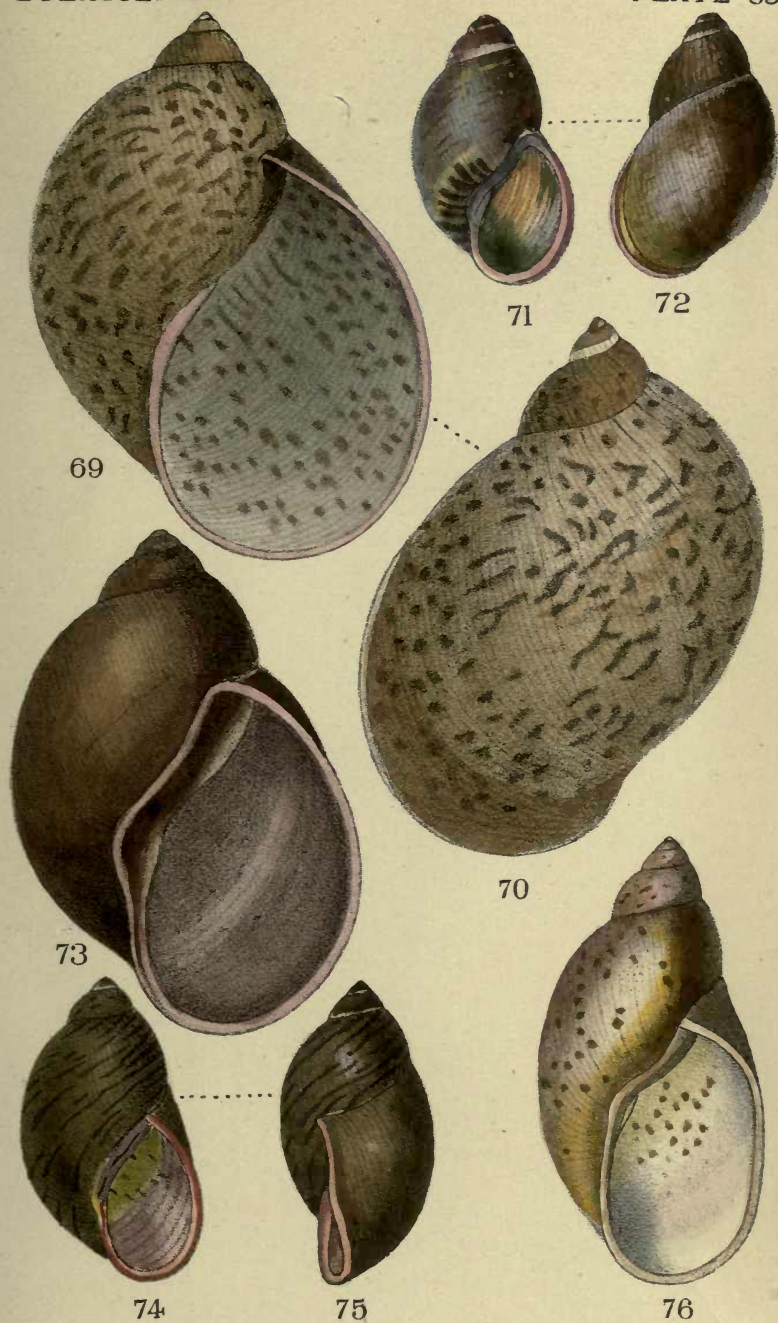


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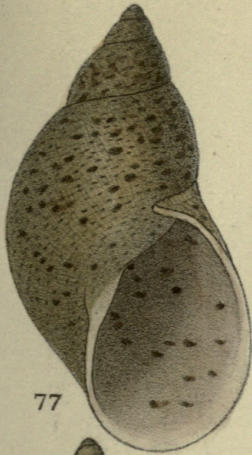












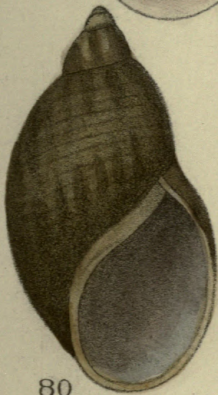
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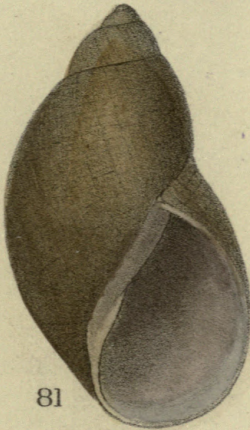
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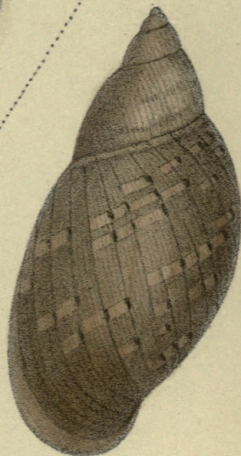
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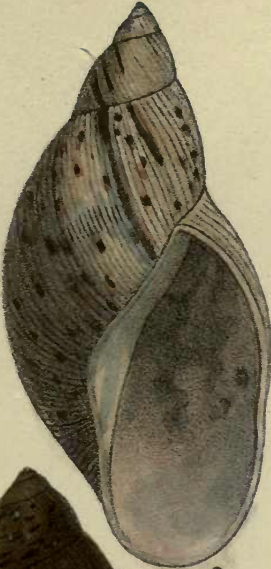








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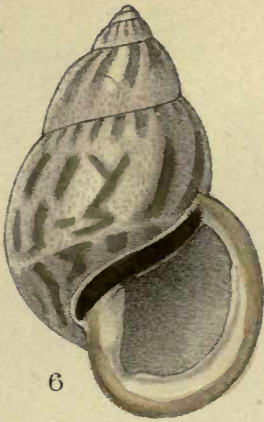
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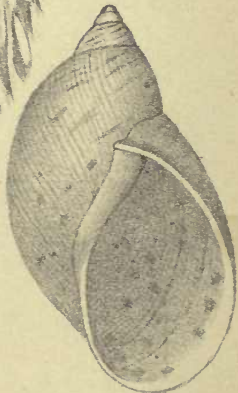
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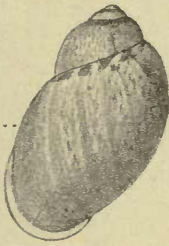
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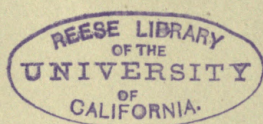
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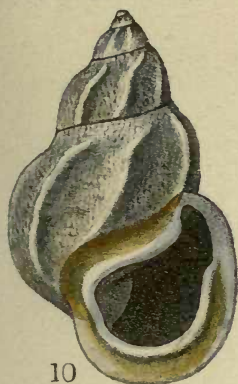
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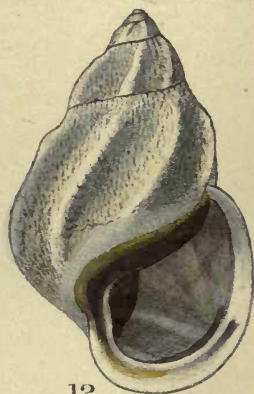




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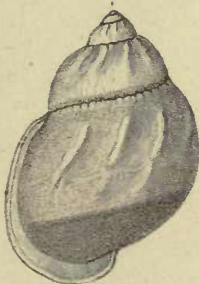
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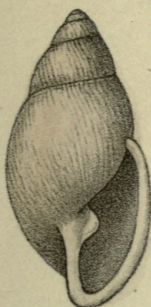
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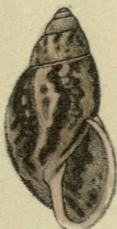
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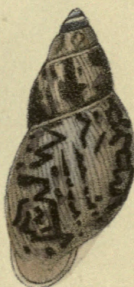
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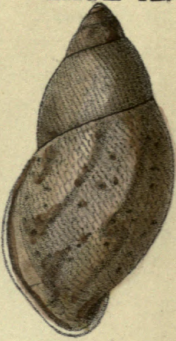
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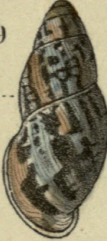
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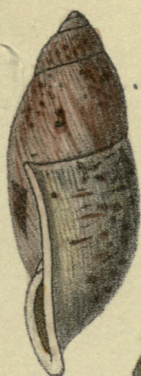




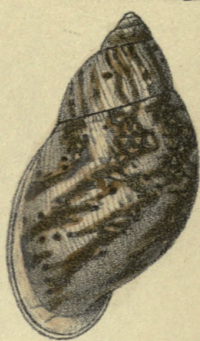




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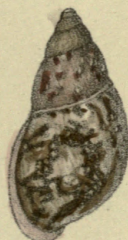
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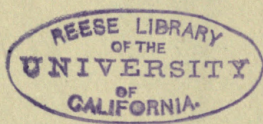


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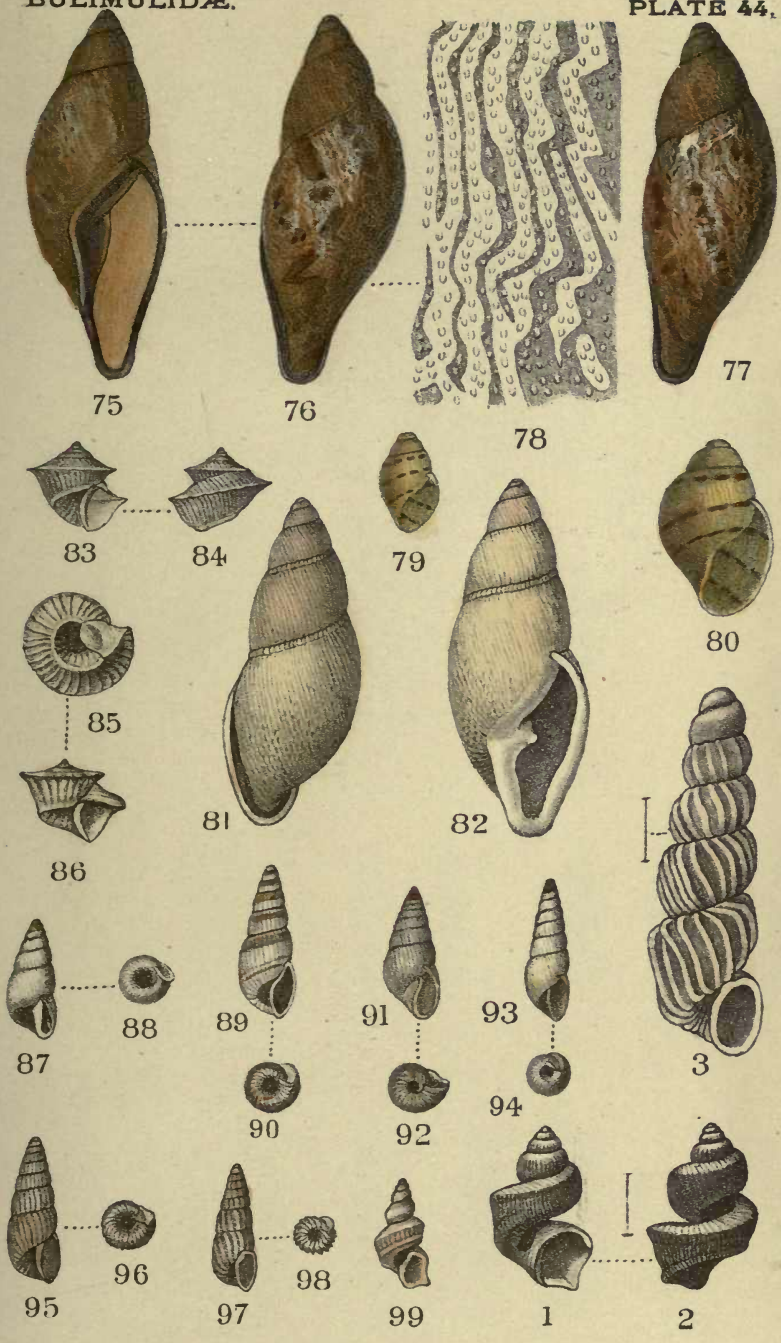


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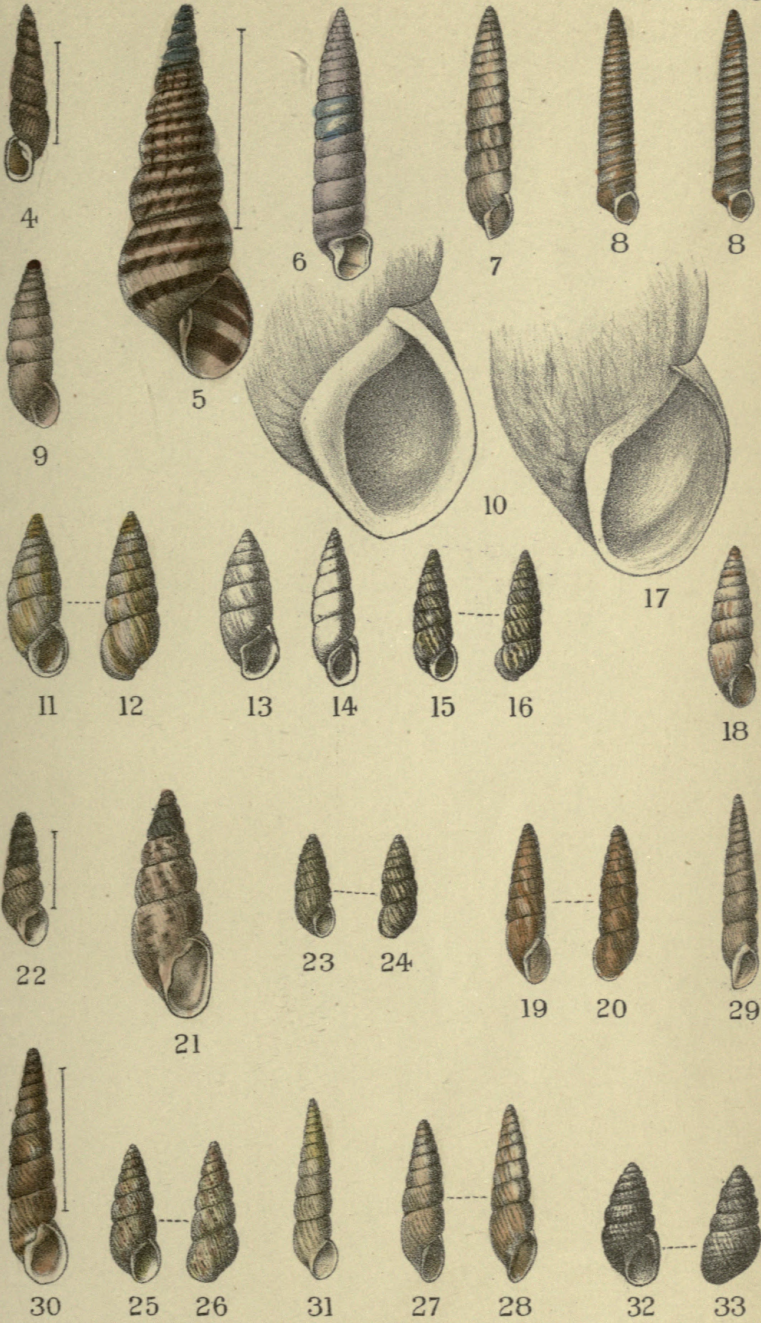








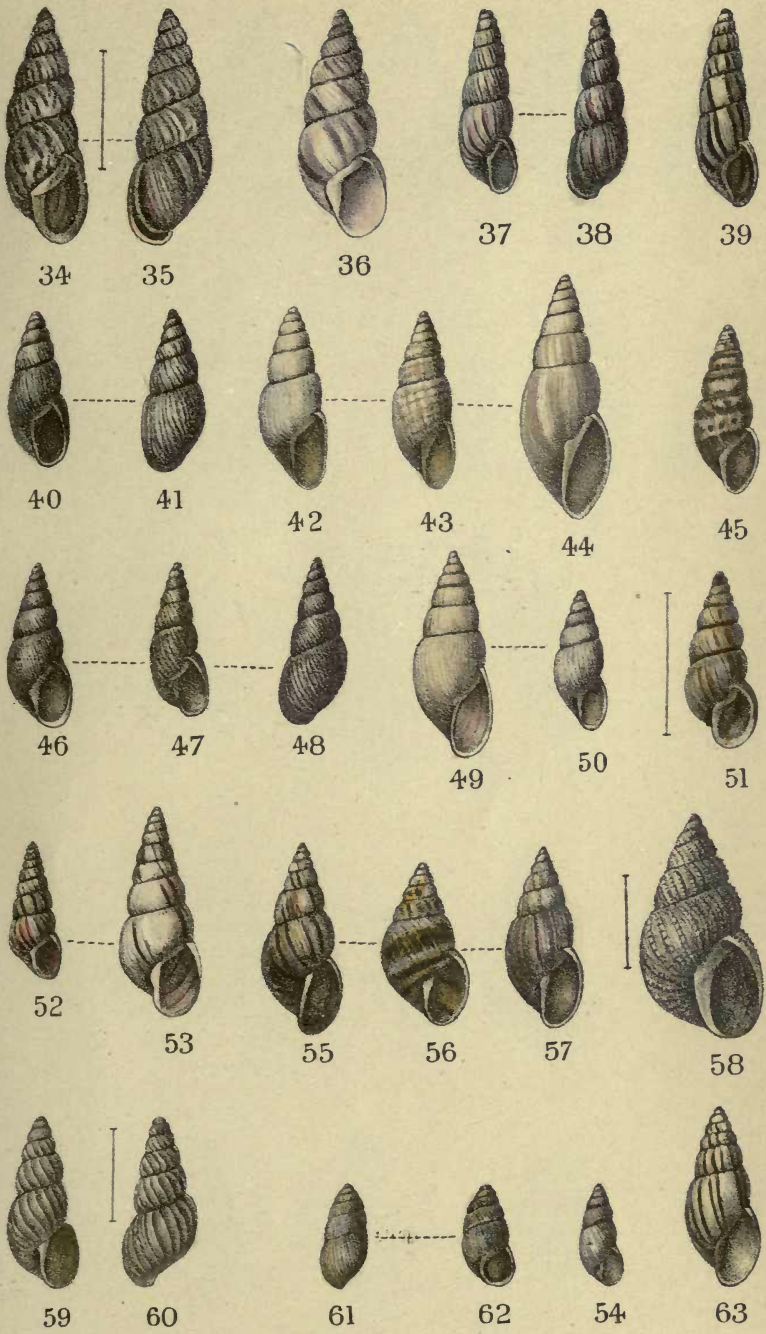






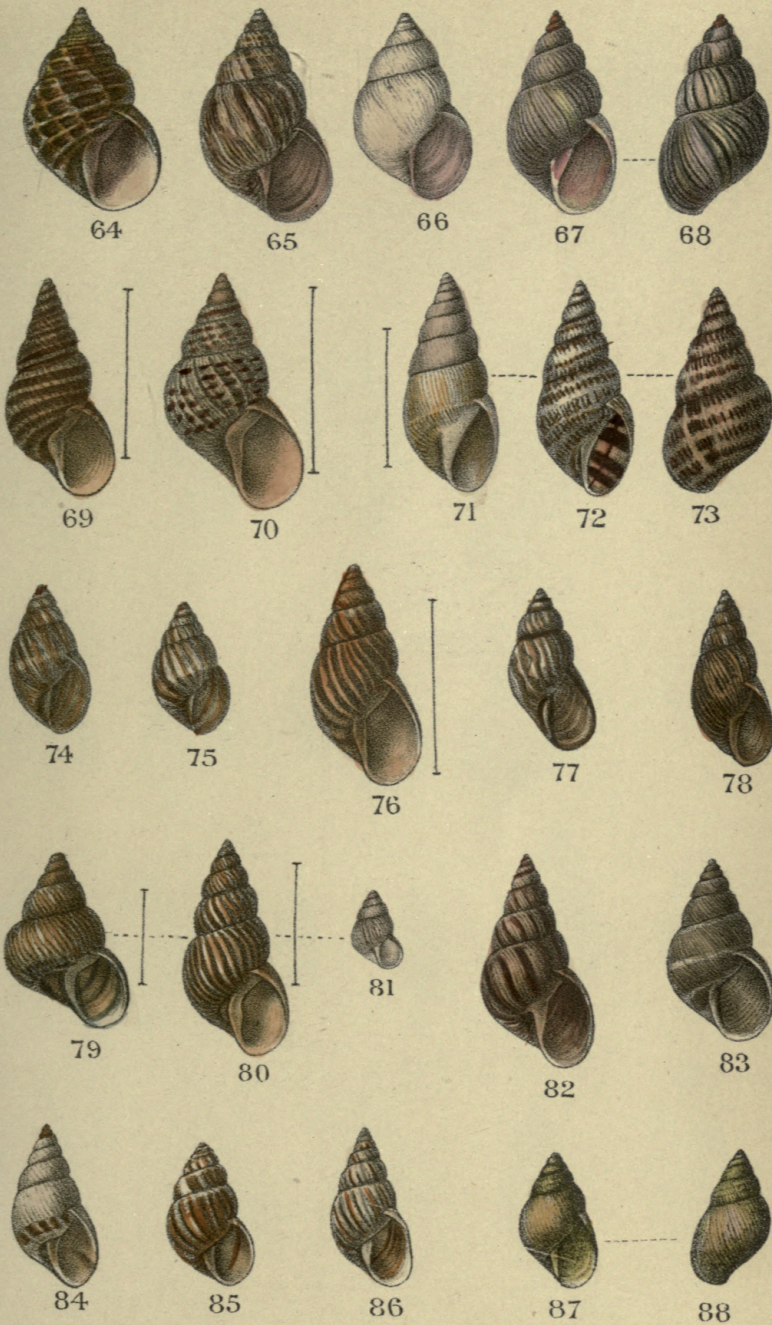




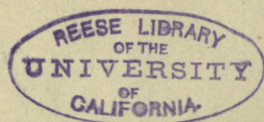




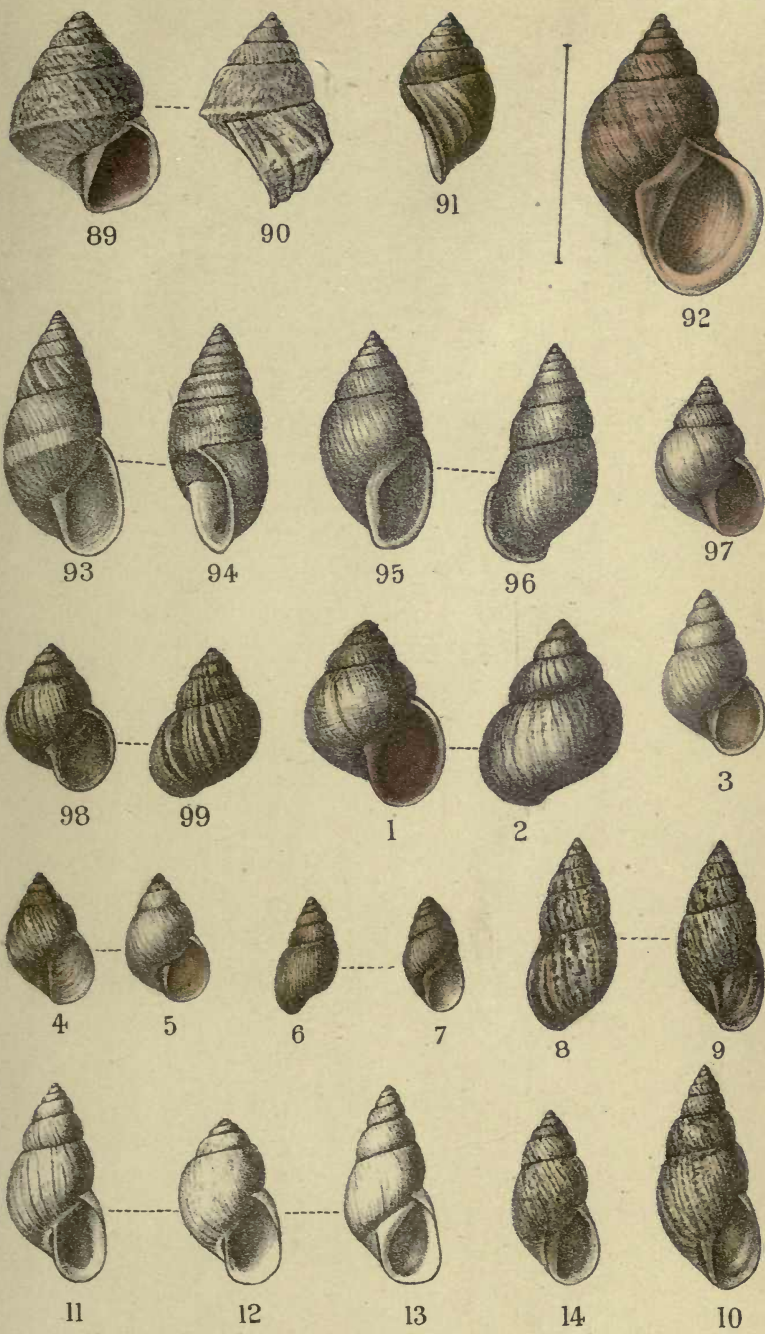










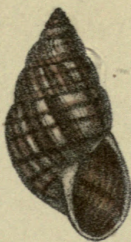




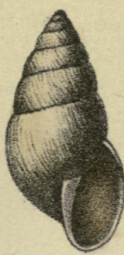




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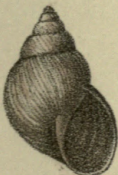
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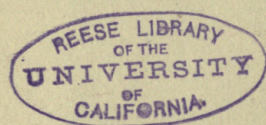


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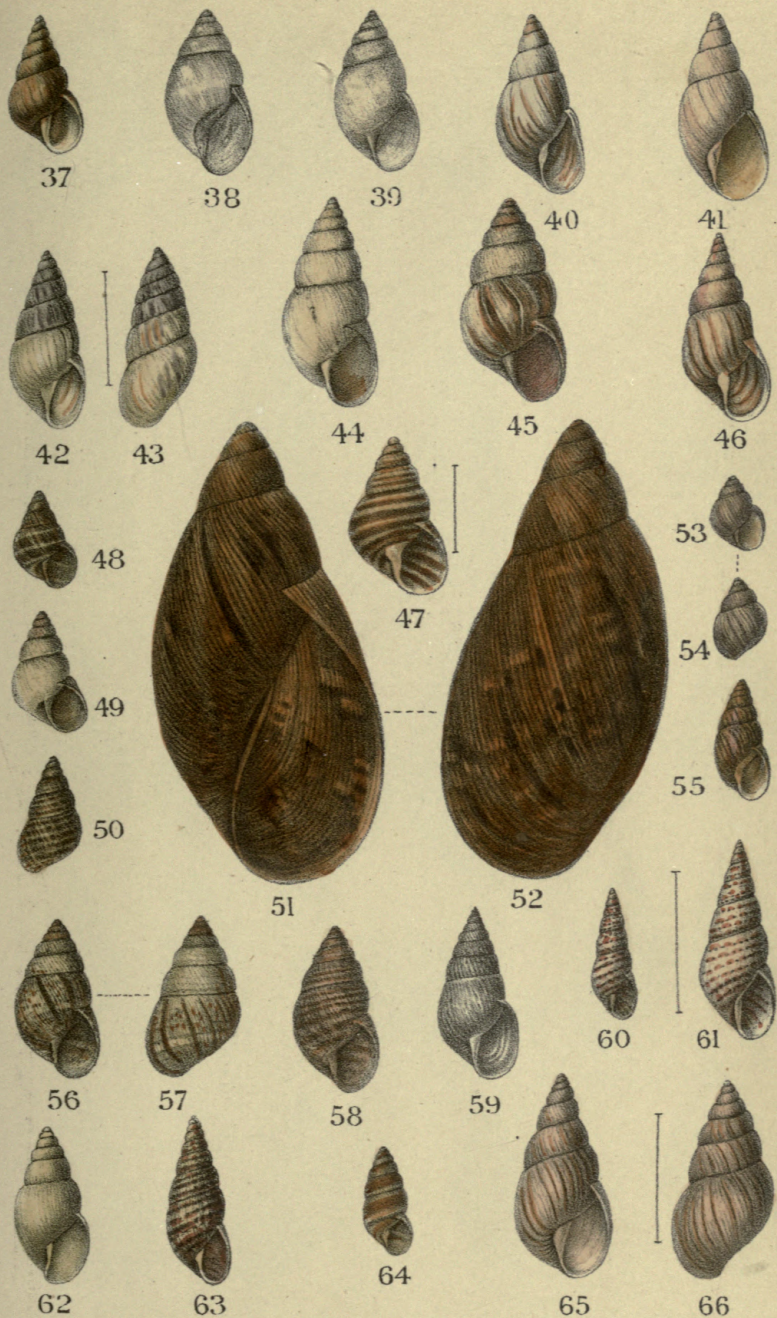


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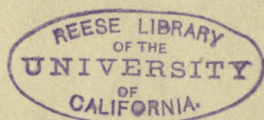
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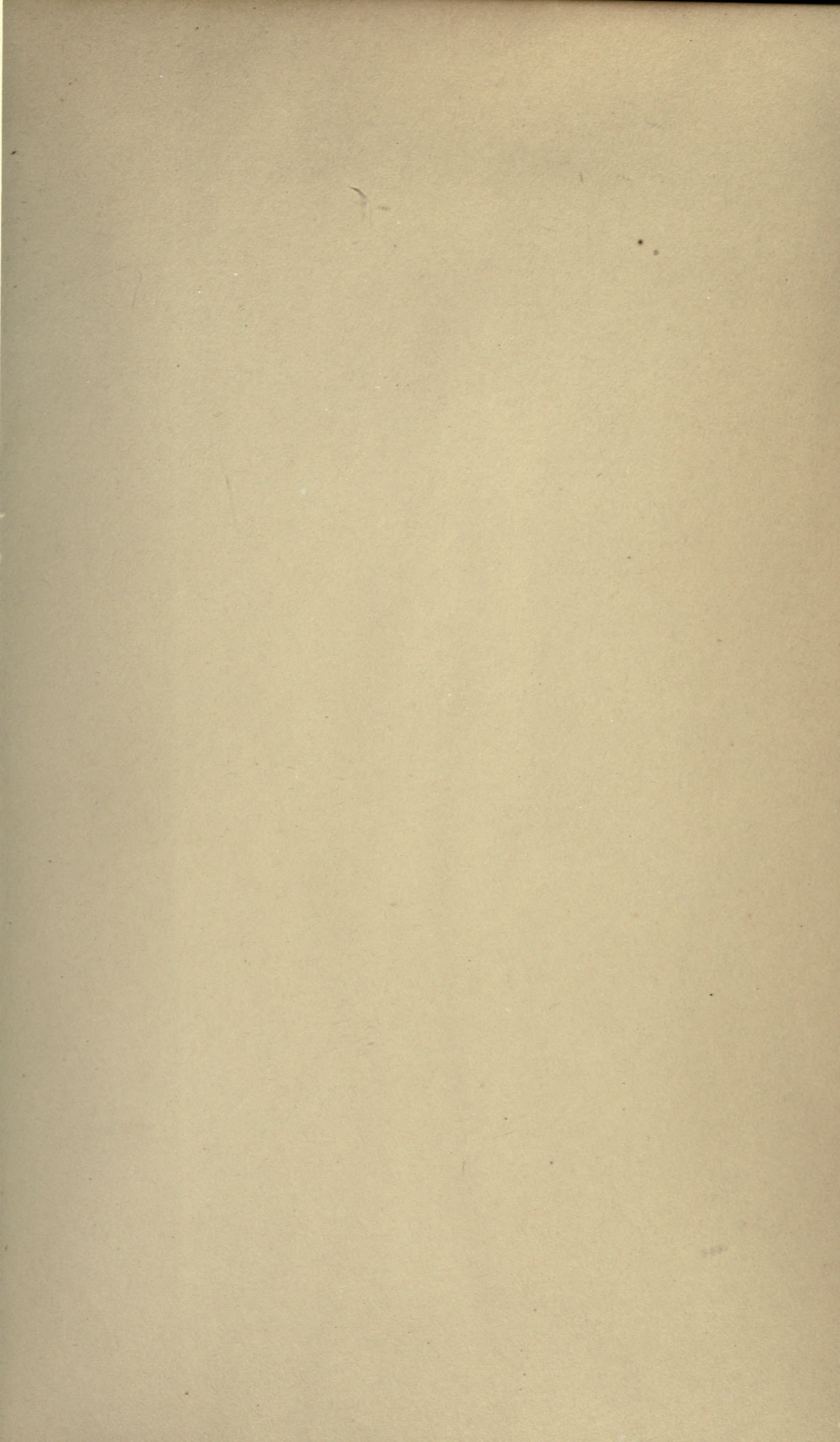
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